NAS DATA

STANDARDIZATION

PROCEDURES

Version 2.0

Federal Aviation Administration
NAS Information Architecture Committee

May 2004

Signature Page

NAS Information Architecture Committee	Routing Symbol	Signature	Date
Member	ATO-R	[illegible]	5-24-4
Member	ATO-R	[illegible]	5-24-04
Member	AIO-300	Thomas [illegible]	5/28/04
Member	ATO-E	Bernie L Sanford	6/4/04
Member	ATO-W	Barbara Cordell	7/9/04
Member	AS4-100	[illegible]	7/14/04
Member			
Executive Secretary	ATO-P	[illegible]	7/14/04
FAA Data Registrar	AIO-300	Diana C Young	6/4/04

Document Control

Change Record

Date	Author	Version	Change Reference
April 2002	Rhoades, Ronald Uri, Carol Parker, Burt Supola, Mojdeh	1.0	Version 1.0
May 2004	Uri, Carol Supola, Mojdeh	2.0	Version 2.0

Reviewers

Name	Date	Version	Routing Symbol
Smith, Therese	March 2004	2.0	ASD-100 (SETA II)
Young, Diana	May 2004	2.0	AIO-100
Jordan, Richard Y.	May 2004	2.0	AIO-300
Brunk, Brett	May 2004	2.0	ATA-40
Cordell, Barbara	May 2004	2.0	AVN-42B

ABSTRACT

This document provides advice on how to create application-independent data standards for representing commonly shared National Airspace System (NAS) data. It describes procedures for initiating, developing, approving, registering, and maintaining NAS data standards as items under NAS configuration control. The procedures support FAA data standardization as established by FAA Order 1375.1C, *Data Management Policy*, and may be used as guidance to FAA-STD-060, *Data Standard for the National Airspace System*.

The document was sponsored by FAA's NAS Information Architecture Committee (NIAC), which is chartered by the NAS Configuration Control Board (CCB) to be responsible for developing NAS data standards for CCB approval. It is organized as follows:

- Chapter 1 describes the purpose and objectives of the NAS data standardization process.
- Chapter 2 gives an overview of the entire process.
- Chapter 3 discusses the roles and responsibilities of participants in the process.
- Chapter 4 gives participants a basic understanding of the essential concepts and tools used in the process, including the ISO/IEC 11179-compliant FAA Data Registry (FDR) in which the data standards are maintained.
- Chapter 5 describes the steps needed to develop a proposed standard, including creating and registering metadata, collaborating with subject matter experts, and compiling a case file to support the proposed standard.
- Chapter 6 describes the steps needed to advance the proposed standard through the NAS Change Proposal (NCP) pre-screening and clearance process toward final approval and publishing in the FDR as a NAS-level data exchange standard.

ACKNOWLEDGEMENTS

The original document was produced through the collaborative efforts of a number of people. Its principal authors were:

- Carol Uri, FAA
- Ronald Rhoades, FAA
- Mojdeh Supola, BAE Systems
- Burton Parker, Paladin Integration Engineering

People who contributed additional materials to Version 2 of this document include:

- Therese Smith, Air Traffic Software Architecture, Inc.
- Robert Stanley, ATSA, Inc./Informon Corp.

Others who have provided advice and assistance over time include:

- Diana Young, FAA
- Richard Jordan, FAA
- Nels Broste, MITRE/CAASD
- Deborah Kane, AMTI

The document incorporates many of the ideas brought forth by members of the FAA's NAS Information Architecture Committee, all of whom believe in the goal of establishing a permanent NAS data standardization program in FAA. It is everyone's hope that this document will play a major part in helping FAA to achieve that goal.

TABLE OF CONTENTS

TABLE OF FIGURES

1.0 GENERAL INFORMATION

1.1 Introduction

Standard data is the cornerstone of the information infrastructure that supports the systems and the overall mission of the Federal Aviation Administration (FAA). Sharing of information is critical to the establishment of National Airspace System (NAS)-wide information services envisioned in the NAS Architecture. Standard data will help the NAS to operate in an integrated, effective, and efficient manner. In December 2001, the NAS Configuration Control Board (CCB) approved the original FAA-STD-060, *Data Standard for the National Airspace System,* for the purpose of establishing application-independent data exchange standards to be applied during the development and support of software systems. Each individual data standard covered by FAA-STD-060 is a description of a data element shared among NAS information systems, and is portrayed through a common set of metadata (data *about* data). The metadata set complies with recommendations set forth in ISO/IEC 11179 and follows best practices for managing shareable data.[1] The individual data standards are maintained in the FAA Data Registry (FDR) tool. For FAA-STD-060 to provide the benefits for which it was intended, the individual data standards must be well constructed, uniformly specified, widely coordinated and accepted by the user community. The overall goal of this document is to ensure that all future data standards do in fact meet these requirements.

1.2 Purpose

This document contains the procedures for initiating, developing, approving, registering, and maintaining NAS data standards in the FDR as items under NAS configuration control. A data standard provides the framework for how commonly used data will be described for sharing across NAS information systems. Other document(s) cover procedures for implementing approved standards. FAA-STD-025, *Preparation of Interface Documentation,* addresses the use of these data standards in NAS application interface requirements documents (IRD) and interface control documents (ICD).

The procedures contained in this document support FAA data standardization as established by FAA Order 1375.1C, *Data Management Policy*, and may be used as guidance to FAA-STD-060. Use of these procedures will improve the consistent and uniform identification and standardization of data.

The remainder of the document is organized around the fundamental activities required to standardize NAS data as follows:

- Chapter 2 provides an overview of the entire data standardization process.
- Chapter 3 discusses the roles and responsibilities of participants in the process.

[1] "For systems to be truly open, data must be portable and shareable within and among these various application environments, which span localized and distributed networks. For data to be shareable, both the users and owners of data must have a common understanding of its meaning, representation, and identification. To understand the meaning of any data, the descriptions of the data must be available to the users from, for example, a Data Element Registry. Data must be adequately described and users must have a convenient way to obtain these descriptions. Data Element Registries provide a way to organize the content and representation of data elements so that data descriptions are consistently specified and can be easily located by data designers and users. Uniform specification of data facilitates data retrieval, data exchange, and consistent use of data throughout the Software Development Life Cycle. The units of information with normalized meanings and formats are known as 'standardized data elements.'" -- *ISO/IEC STANDARD 11179-1, Metadata Registries*

- Chapter 4 gives participants a basic understanding of the essential concepts involved in creating data standards, and describes tools that the FAA provides to help with the work.
- Chapter 5 discusses in more detail the steps required to develop a proposed standard, including creating and registering metadata, collaborating with subject matter experts, and compiling a case file to support the proposed standard.
- Chapter 6 discusses in more detail the steps required to advance the proposed standard through the NAS Change Proposal (NCP) pre-screening and clearance process toward final approval and publishing in the FDR as a NAS-level data exchange standard.

1.3 Applicability and Scope

This document is intended to guide users and stewards of systems in the NAS on how to develop application-independent standards for exchanging commonly shared NAS data. For policy and requirements for data standardization, refer to Order 1375.1C and FAA-STD-060.

The FAA's Office of Information Services provides the agency-wide policy and guidance for data standardization, and the NAS Information Architecture Committee (NIAC) is the group chartered by the NAS CCB to manage the standardization process for NAS data. The NAS CCB approves the standards and maintains them as NAS-level requirements.

To maximize data sharing across systems in the NAS, data standards must be registered, approved, and stored in the FDR**.** The FDR is the authoritative source of FAA data standards, and is the mechanism to be used in the data standardization process. The FDR has been made publicly accessible via the internet (user-ID and password is required) to facilitate the creation and use of aviation data exchange standards throughout the aviation community,

Functional and Component level dictionaries and repository tools should complement the NAS level of functionality. These tools may provide internal requirements not supported by the FAA tools, and they may support the implementation of approved data standards.

1.4 Objectives

The objective of NAS data standardization is the use and reuse of data standards throughout the NAS in support of interoperability, data sharing, system design and development, system integration, and business process improvements. Specific objectives are:

- Enhance information system interoperability by reducing the requirements to translate and transform data.
- Reduce the cost and time to develop, implement, and maintain systems.
- Provide uniform descriptions and representations of commonly shared data.
- Improve data integrity and accuracy.
- Control data redundancy.
- Document and maintain approved data standards in the FDR.

- Use applicable international, national, and Federal standards, where appropriate.
- Contribute toward the development and maintenance of those portions of the FAA Data Architecture's Corporate Data Model that depict the NAS information requirements.

2.0 DATA STANDARDIZATION PROCESS OVERVIEW

2.1 Introduction

The NAS Data Standardization process is composed of two parts: standards development and standards approval. Standards development is characterized by research and analyses of candidate data standards, whereas the approval process consists largely of vetting the proposed standards and reaching consensus.

2.2 Standards Development

Any party that perceives a need to standardize a data element or data concept can initiate the development process. This "need" can be driven by a system engineering action such as a new system development or a system modernization. Actions are illustrated in Figure 1.

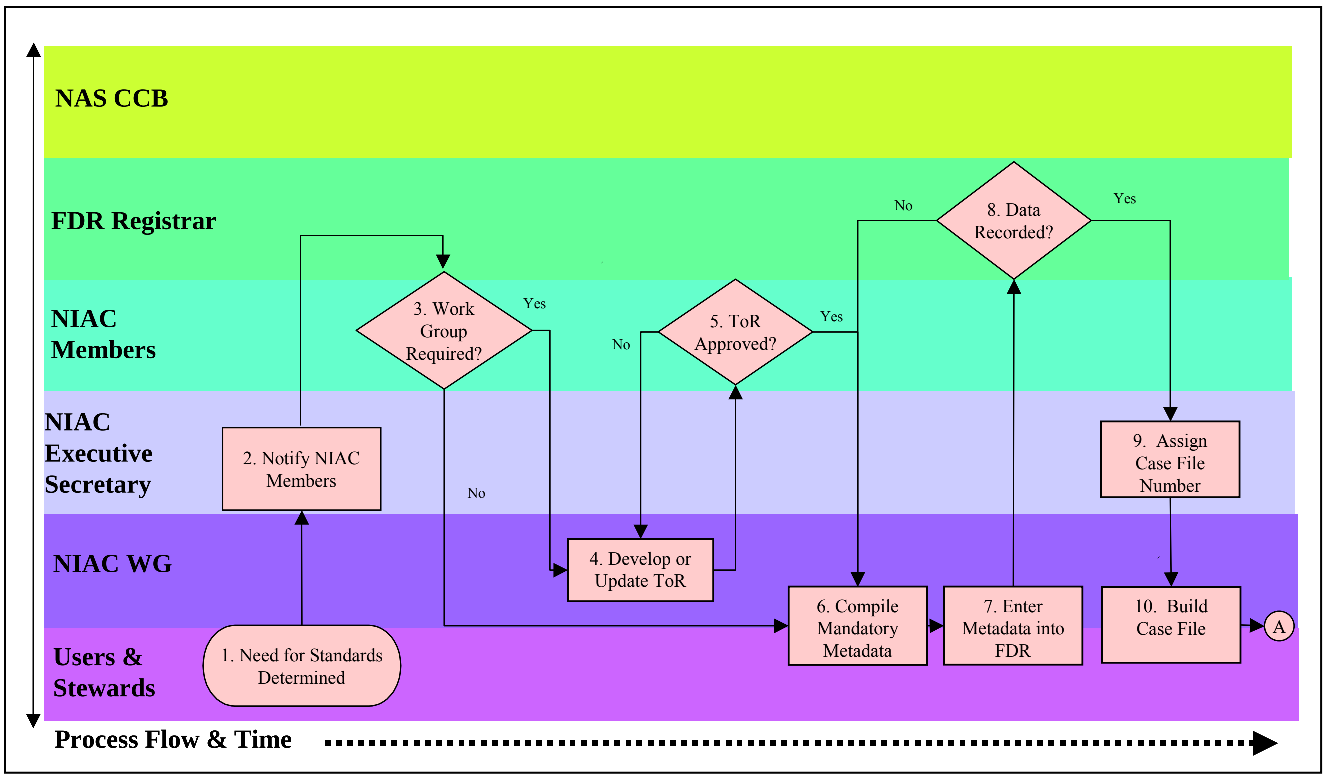


Figure 1: Standards Development Process

The need for a standard must be reviewed against the FDR to determine if another data element that might fulfill the specific need has already been standardized. If so, the initiator—ordinarily a steward or user of the data—should adopt the existing standard for the specific use, and register the system involved with the FAA Metadata Repository (MDR) so that the system steward may be kept informed of any potential actions affecting the given standard. Data elements and other administered items[2] that are data standards or potential candidates for standardization are registered in the FDR. If applicable data elements have been registered but not standardized, then regardless of their status, the initiator should find this information to be a good basis on which to commence a standardization effort. Finally, if there

[2] Administered items are any metadata components that are managed in an ISO/IEC 11179-compliant data element registry, such as the FDR, and are further discussed in Chapter 4.

is no information documented in either registry, the initiator will have a basis for proceeding to standardize his/her data elements. The initiator may always call upon NIAC and the FDR Registrar to help find existing standards or determine the need for new ones.

The initiator then contacts the NIAC Executive Secretary, who notifies the NIAC Permanent Members of the potential standardization effort. The Permanent Members, a small group of senior-level FAA staff with NIAC voting rights who represent the various Lines of Business of the FAA, will determine whether a Working Group of subject matter experts is needed to help develop the standard, based on the size and complexity of the standardization task. If the Members concur, the Working Group is formed ad hoc with a common interest in the proposed data standard. A Terms of Reference (ToR) contract that describes the Working Group's composition, leadership, interest, products, and goals is developed for approval by the Members. If a Working Group is not required, the steward or user who initiated the need for a standard will be directed to continue with the process as an individual.

The development process now expects that either the individual initiator or Working Group will compile the mandatory metadata as prescribed by the FDR. When these registry requirements are complete, the Executive Secretary assigns a case file number and the case file continues as an authorized NIAC activity. The case file documents are completed for entry into the approval process.

2.3 Standards Approval

The approval process is designed to qualify and formally review proposed data standards and their supporting material. Once reviewed and unanimity in metadata documentation is achieved, a standards decision may be made by the NAS CCB. Figure 2 illustrates the steps and actions of this process.

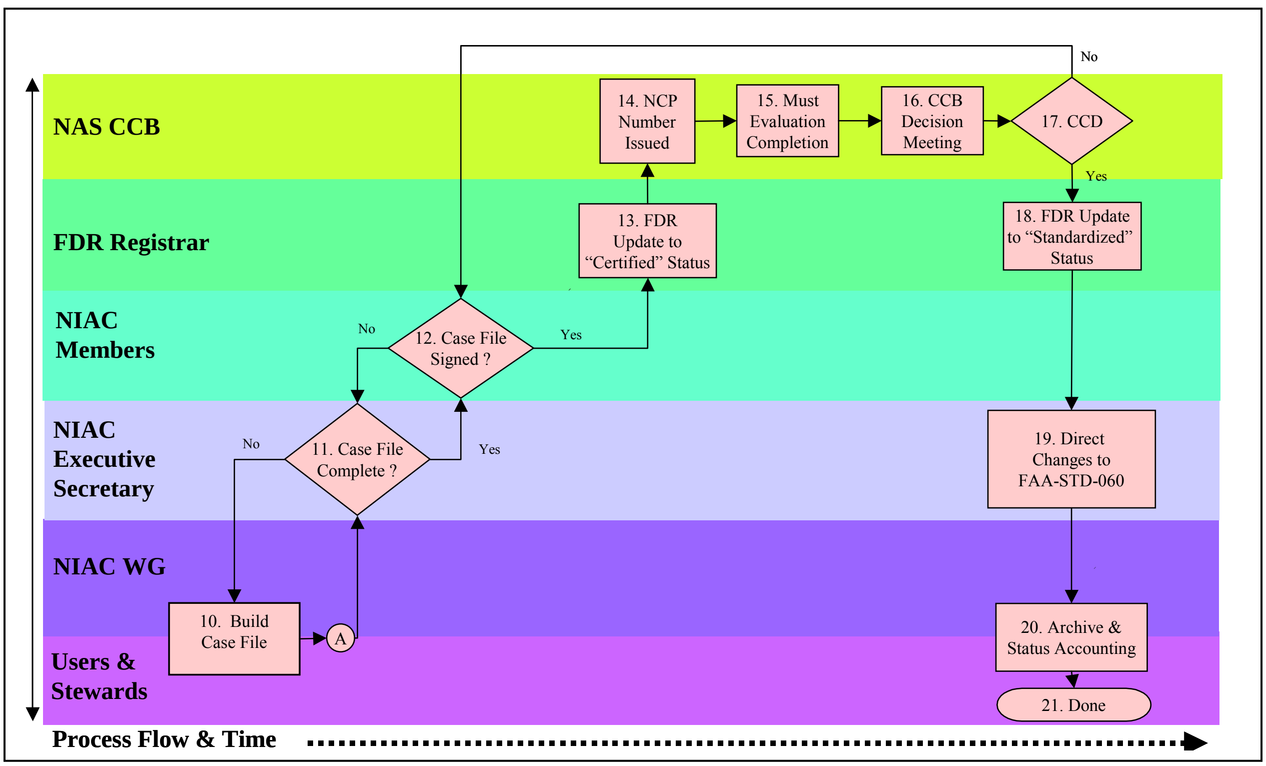


Figure 2: Standards Approval Process

The process describes moving the proposed data standard through the examination, review, and approval steps as a **case file**. The case file is an artifact for handling configuration management items. Traditionally, the case file describes proposed changes to a system's hardware or software baseline. In this process, the case file describes proposed changes to metadata. Note that any number of proposed data standards might be submitted in a single case file.

In the earlier discussion, the initiator (data steward or other user) or the Working Group compiled the case file. The case file is a collection of information about the proposed standard(s) with any relevant supporting materials such as a) related data elements; b) results of collaboration among stakeholders; c) documented requirements for the data standard(s); d) a relevant data model or system data blueprint; and e) an updated NAS data model or mosaic. The whole package is forwarded to the NIAC Executive Secretary for a completeness review and processing.

The Executive Secretary then presents the case file to the NIAC Members for pre-screening review. The Members examine the material in the case file for completeness with respect to each Member's Line of Business. If there are no issues for resolution, the package is signed by the Members and submitted to the NAS CCB Control Desk. The Control Desk handles the CCB administrative actions and the staff issues and assigns a NAS Change Proposal (NCP) number and sets up the **must evaluation**. The must evaluation is a final screening by NAS stakeholders. Issues must be evaluated and resolved before a case file is presented to the CCB for approval. Once it is approved by the CCB, a Configuration Control Decision (CCD) is announced, and a new FAA standard is established.

Various administrative and registration statuses of the proposed data elements in the FDR have been assigned by the FAA Data Registrar and updated throughout the process. Now, as the case file exits the CCB process, the Registrar is alerted to the event and will change, as appropriate, the status of the data elements to “standardized.” The case file then is returned to the Executive Secretary for action that will include making the required additions or updates to FAA-STD-060, which is the formal document supporting the data standards. The case file is then archived, and the initiator or the Working Group completes the cycle by performing the housekeeping task of status accounting or closing the books, as may be appropriate.

3.0 ROLES AND RESPONSIBILITIES

3.1 Introduction

Development of NAS data standards requires participation across all NAS functional communities. This chapter identifies the key participants and their roles and responsibilities in the NAS data standardization process.

3.2 Participant Roles and Responsibilities

3.2.1 NAS Configuration Control Board

The NAS CCB is the authoritative decision making body for all proposed NAS data standards. For detailed information on the operation of the CCB, refer to the NAS CCB Charters and Operating Procedures.

3.2.2 NAS Information Architecture Committee

The NIAC is the group chartered by the NAS CCB to manage the standardization process for NAS data. For more information on the operation of NIAC, refer to its Charter and Operating Procedures.

3.2.3 NIAC Permanent Members

The NIAC Permanent Members are the designated FAA senior-level individuals who must approve the products and output of the NIAC. They act as pre-screening authority for changes presented to the NIAC, including signing NAS data standard case files before they are submitted to the NAS CCB. They approve the ToR contracts with the NIAC Working Groups, and they ensure that implementation actions assigned to the NIAC are completed as specified in Configuration Control Decisions (CCDs).

3.2.4 NIAC Executive Secretary

The NIAC Executive Secretary facilitates and supports the Working Group activities, including assistance with meeting logistics and collaboration tools. The Executive Secretary has the key administrative role of monitoring and tracking the progress of the Working Groups and managing relations with the NAS CCB.

3.2.5 Data Steward

A data steward is responsible for the accuracy, reliability, quality, and currency of descriptive information (metadata) about data in his/her assigned area of responsibility. Within the context of this document, a (NAS data standardization) data steward[3] is not necessarily responsible for the data that is

[3] According to ISO/IEC FCD 11179-6, Section C.2.3.2, "A Steward shall be an organizational unit of the Metadata Registry community. Stewards should be responsible for the accuracy, reliability, and currency of descriptive metadata for Administered Items … Stewards should be responsible for metadata within specific areas and may have responsibilities that cut across multiple areas (e.g., value domains such as date, time, location, codes of the Countries of the World)." Subsequent revision of FAA-STD-060 will update the Data Steward title and definition to reflect the ISO/IEC definition and clarify the fact that this role is not necessarily responsible for the actual data, only the metadata.

being standardized. Every established data standard will have a steward assigned who will be responsible for maintaining that standard throughout its life cycle. If changes are proposed to a standard, the appropriate data steward will review and consider comments and recommendations.

Data stewards are usually responsible for the data in specific information systems and are subject matter experts for the data within the information systems they are assigned. Data stewards play an essential role in the creation of NAS data standards by working with the FAA Data Registrar to resolve data integration issues, assign data element names, write definitions, specify business rules, identify sources of data, and establish data quality, security, and retention requirements. Data stewards are encouraged to submit candidate data elements for registration and standardization and to participate in NIAC Working Groups that are involved in their specific subject areas.

Data stewards will perform the duties assigned to them by FAA Order 1375.1C. The data steward is also responsible for managing and transferring appointments as necessary and will update the FDR accordingly. Refer to the Order for more information about stewardship assignment and responsibilities.

3.2.6 FAA Data Registrar

The FAA Data Registrar, or Registrar, is the person dedicated to the control of data standards and supports the NIAC Permanent Members with NAS data standards development and publication.

The Registrar provides overall technical direction of FDR operations in accordance with ISO/IEC 11179 and FDR policies and procedures.

The Registrar promotes the reuse and sharing of data in the FDR within and across functional areas and among external interested parties.

3.2.7 Working Groups

The basic organization for the compilation and creation of a case file of proposed data standards is the Working Group. The Working Group operates under a ToR contract with NIAC and is led by a chairperson who has the managerial responsibilities to generate and follow up on the case file. There is no requisite size for a Working Group, but the composition should represent those systems in the NAS that have a vested interest in the metadata under evaluation.

4.0 DATA STANDARDS CONCEPTS AND TOOLS

4.1 Introduction

This chapter describes the key components of the standardization process infrastructure and explains how they are used to support the collection, validation, and documentation of NAS data requirements. Key components include:

- FAA Data Registry – FDR
- FAA Data Architecture
- Data Standardization Requirements Information Sources
- FAA Metadata Repository – MDR
- Data Modeling Tools
- Lexicon of Terms (under development)
- Groupware Collaboration Tool – CDIMS

4.2 FAA Data Registry

The FAA Data Registry is the heart of the infrastructure. It is a tool for recording, publishing, and maintaining metadata about application-independent data standards. It provides information about the precise meaning of NAS data,[4] and it provides a place to capture information during the development of data standards. It is the authoritative source for FAA data standards. This section highlights important concepts and definitions with which one should be familiar in order to understand how the FDR is used to create and maintain data standards.[5] Details of the kinds of metadata FDR maintains, and the conventions by which the metadata is created, are contained in the Appendixes to this document.

4.2.1 ISO/IEC 11179

FDR is based on the ISO/IEC 11179 standard (ISO = International Organization for Standardization, IEC = International Electrotechnical Commission) entitled *Metadata Registries*.[6] The purpose of the ISO/IEC 11179 standard is to support the identification, definition, registration, classification, management, standardization, and interchange of data elements and to promote the sharing and exchange of data throughout the international community. This standard has six parts:

Part 1: Framework for the specification and standardization of data elements
Part 2: Classification for data elements
Part 3: Registry metamodel and basic attributes
Part 4: Rules and guidelines for the formulation of data definitions
Part 5: Naming and identification principles for data elements
Part 6: Registration of data elements

[4] Note: The FDR has been established as the Registry for both NAS and Non-NAS data standards. Non-NAS data standardization procedures are defined in a separate document.
[5] Material in this section was originally derived from: *Data Element Registry User's Guide and Reference V1.0*, March 2001 by Gail Wright, Oracle Corporation.
[6] The ISO/IEC 11179 *Metadata Registries* document is a standard under revision by the Joint Technical Committee 1 (JTC1) Data Management and Interchange Subcommittee 32 (SC32). Part 3 is an approved standard as of 2/15/2003.

4.2.2 Administered Item

An **administered item** is an object that requires naming, identification, and administration (management). The FDR supports the following administered items:[7]

- Data Elements
- Data Element Concepts
- Value Domains
- Conceptual Domains
- Object Classes
- Properties
- Classification Schemes

Figure 3 is a high-level model showing how the first four items are related. These four are integral to specifying data elements.

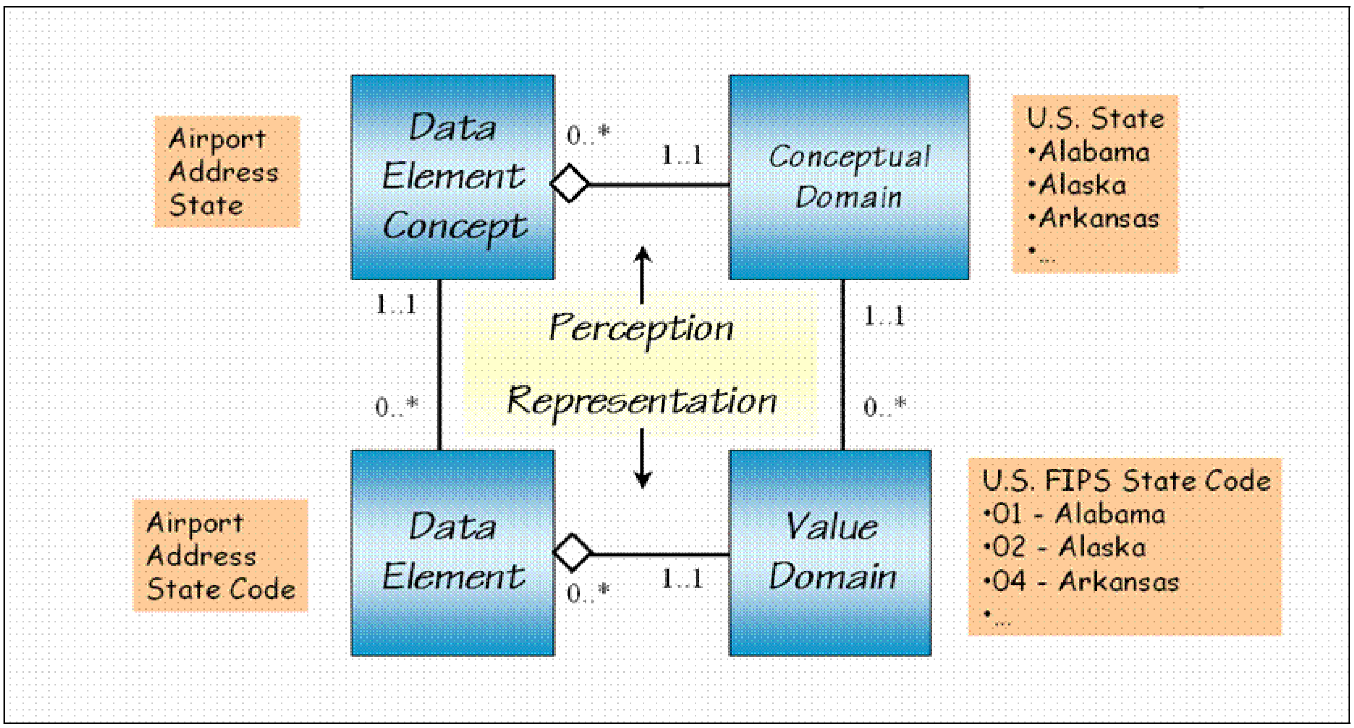


Figure 3: ISO/IEC 11179 UML Metamodel

[7] ISO/IEC 11179-3 specifies nine administered items. The two that FDR does not currently support are Context and Representation Class. (Context does exist as a non-administered attribute in FDR.) In addition, a tenth item, Derivation Rule (which also exists in FDR as a non-administered attribute) has been proposed as an administered item in the next version of 11179-3.

Following are some additional examples[8] of administered items that help to illustrate the ideas portrayed in Figure 3.

Data Element Concept: "Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade.
Note: The data element concept makes no reference to a specific value domain.

Conceptual Domain: "Monetary Amount"
Definition: An amount that may be expressed in a unit of currency.
Note: The definition refers to a "dimensionality" of currency, but not to a specific currency.

Data element 1: "European Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade expressed in Euros.

Data element 2: "U.S. Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade expressed in US dollars.
Note: Data element definitions may refer to explicit value domains, since this may be all that distinguishes two data elements.

Value Domain 1: "Amount in Dollars"
Definition: A numeric quantification of a monetary value expressed in monetary units of U.S. dollars and cents in the form "$$$$.¢¢," where "$$$$" represents dollars to whatever number of significant digits is required and "¢¢" represents the number of cents.

Value Domain 2: "Amount in Euros"
Definition: A numeric quantification of a monetary value expressed in monetary units of Euros and cents in the form "€€€€.¢¢," where "€€€€" represents Euros to whatever number of significant digits is required and "¢¢" represents the number of cents.

All of the administered items are discussed more thoroughly in the sections that follow.

4.2.3 Data Element

A **data element** is a unit of data that in a certain context is considered indivisible. Often, the terms "variable," "code," and "field" are used synonymously to mean a data element (e.g., Person Name, Person Age, Hospital ID, and Airport Elevation).

Derived data elements (also called complex data elements) are a special grouping of data elements and have a **derivation type** (also called representation type) as illustrated in Figure 4 below.

[8] The definitions for data element concept, conceptual domain, and both data elements were taken from ISO/IEC FDIS 11179 Part 4 as of 2/12/04

Derivation Type	Derived Data Element	Sub Data Elements	Description
Compound	Mailing Address	Street Address City State Zipcode	Grouping of Data Elements with a Display Order
Concatenation	Telephone Number	Phone Area Code Phone Exchange Phone Instrument	Grouping of Data Elements with a Display Order and Concatenation Character
Object Class	Person	Person ID Person First Name Person Last Name Person Age Person Sex	Grouping of Data Elements with optional Methods
Calculated	Person Annual Salary	Person Weekly Salary	Data Elements with a Derivation Rule (e.g. PAS = PWS * 52)

Figure 4: Derived Data Element

Furthermore, two data elements can be related to each other with a specified relationship (e.g., Part-of, Similar To, etc.).

4.2.4 Data Element Concept

The difference between a data element and a **data element concept** is that a data element has a physical representation (data type, maximum length, interchange format, unit of measure, valid values, etc.), while a data element concept does not have a physical representation. A data element concept is just the *idea or perception* of the data element, e.g., “I am thinking of Person Income, but I cannot tell you if it is represented in dollars or yen.” Data element concepts are useful for grouping similar data elements, and they may be used in a process for harmonizing data elements.

A data element concept consists of an **object class** and **property**. An object class is a thing or abstraction in the real world for which one would want to record information. It is much like an “entity type” in relational terms, e.g., Person, Organization, or Airport. A property is a unit of information about an object class. It is much like an “attribute” in relational terms, with the important exception that a property does not have a specified representation, e.g., Age of a Person, Sex of a Person, Number of

Employees in an Organization, Elevation of an Airport. A data element concept's object class and property determine its name.

Concepts can be related to each other, and the **relationship** between the data element concepts can be specified (e.g., Part-of, Similar To, etc.).

Note: In the FDR, a "data concept" is the same as the "data element concept."

4.2.5 Value Domain

A data element is represented by a **value domain**. A value domain establishes the permissible values that can be used to represent a data element. A value domain has a **data type** (e.g., Boolean, decimal, integer) and, optionally, a **unit of measure** (e.g., feet, miles, dollars) and an **interchange format** or layout of a representation for data interchange (e.g., YYYYMMDD for representing a date). A value domain can be **enumerated** (specified through a list of at least two individual permissible values) or **non-enumerated** (specified by a range of numbers, set of rules, formula, procedure, etc.).

Permissible values are valid values for an enumerated value domain. The permissible value is represented by a permissible value and a **value meaning**. An example would be "AL" (permissible value) and "ALABAMA" (value meaning) for the "Postal U.S. State Codes" (value domain). Value meanings may be maintained and reused, such as "ALABAMA" (value meaning) also being used for "FIPS U.S. State Codes" (value domain) with a permissible value of "01."

Value domains can be related to each other and the **relationship** between the value domains can be specified (e.g., Part-of, Similar To, etc.). Thus, the Postal U.S. State Codes and FIPS U.S. State Codes might be assigned the relationship of "Is Equivalent To".

4.2.6 Conceptual Domain

A **conceptual domain** is to a value domain as a data element concept is to a data element. While a data element concept does not have a value domain, it does have a conceptual domain without specific physical representations. A conceptual domain is the *perception* of a value domain and may be associated with items (meanings) that belong to the domain, but without their physical representations (valid values). To illustrate, one might say, "I am thinking of States of the United States. The states are Alabama, Alaska, Arkansas, etc., but I do not know if they are represented by Postal Codes (e.g., AL, AK, AR) or by FIPS Codes (e.g., 01, 02, 04)."

Instead of assigning permissible values to a conceptual domain, only value meanings may be assigned. To illustrate, one might say, "I am thinking of a Value Domain for U.S. State, but I cannot tell you if it is represented by Postal codes or FIPS codes, but I can tell you that it is made up of the following states (value meanings): Alabama, Alaska, Arkansas, etc."

Conceptual domains can be related to each other, and the **relationship** between the conceptual domains can be specified (e.g., Part-of, Similar To, etc.).

4.2.7 Object Class and Property

An **object class** is a thing or abstraction in the real world that is desirable to be modeled. It is much like an "entity" in relational terms. (For example: Person, Airport, Aircraft, Facility, etc.) A **property** is a peculiarity common to all members of an Object Class. It is much like an "attribute" in relational terms, with the important exception that a Property does not have a specified representation. (For example: Elevation, Location, ID, First Name, Last Name, Address, etc.) A potential source for FAA object classes is the FAA Data Architecture which contains hundreds of entities and their definitions. The entities may be considered in identifying or naming object classes, concepts and data elements.

As is the case for the other administered items, relationships between two object classes or two properties can be specified (e.g., Part-of, Similar to, etc.).

4.2.8 Classification Scheme

A **classification scheme** (CS) is used to classify or group data elements in order to organize them and make them easier to find and analyze. There are many kinds of schemes, including keywords, thesauri, taxonomies, ontologies, etc. A CS has a **classification scheme type** (e.g., taxonomy or keyword), and it is made up of **classification scheme items** (CSI) that may be hierarchical. The CS-CSI pair may be associated with zero or more data elements, and a data element may be associated with zero or more CS-CSI pairs. Relationships between two schemes can be specified (e.g., Part-of, Similar to, etc.).

There are two classification schemes in the FDR at present. One is a simple scheme called the "Standards Approval Authority" with two CS items, "NAS" and "non-NAS". This scheme exists to classify data standards according to the organization that approved the standards. The other is a scheme called the NAS Data Classification Scheme.[9] It is a taxonomy composed of a set of keywords arranged in a shallow hierarchy from general to more specific descriptors and is designed to support the analysis of and access to the descriptions of NAS data recorded in the registry. Like any administered item, it must be taken through the review and approval process to become a standard.

4.2.9 Context

A **context** is an important concept in the FDR. The ISO/IEC 11179 standard defines a context as a "designation or description of the application environment or discipline in which a data standard is applied or from which it originates." Alternatively, it is the scope in which a particular administered item has meaning. A context may be a business domain, an agency, an information subject area, an information system, a database, file, data model, standard document, or any other environment. To illustrate, suppose that two user communities each deal with information that they both call "flight time en route." However, one community considers flight time en route to include the initial climb as part of the en route phase of flight, whereas the other community does not. A third party receiving flight time en route data would have to know its context in order to interpret it correctly.

Context is similar to the notion of namespace, used by various computing disciplines. In a 11179-compliant registry, data elements and other administered items must be uniquely named within a particular context, and a context must be assigned to each administered item. Assignment of a context

[9] The NAS Data Classification Scheme V1.0 is undergoing final validation as of May 2004.

to a data element in FDR means that (1) the element has meaning and utility only within that context and (2) the element is uniquely named and defined within that context, i.e., another element with the same name but a different definition, or with a different name but an identical definition, may not exist in that context.[10] The procedure for proposing, approving and establishing a new context in FDR is described in Appendix 6.

4.2.10 Stewardship, Registration, and Administration of Administered Items

The ISO/IEC 11179 standard provides a standardization process where data elements and other administered items are formally submitted to a **registration authority** for standardization. There are three important roles and functions that are part of this process: stewardship, registration, and administration.

4.2.10.1 Stewardship. Each administered item has a data steward who is responsible for the metadata quality of an object and is the point of contact for a given data element. (Note: This person does not necessarily create or maintain the metadata.) The data steward belongs to an organization. An organization can be identified at any level (e.g., agency, program area, staff area, or project); however, the FDR does not store the hierarchical organization chart.

4.2.10.2 Registration Status. When a data element or other administered item is registered, it must conform to ISO/IEC 11179 standard and FDR requirements. ISO/IEC 11179 specifies the valid values of registration status as:

- Incomplete: The registered item does not contain all Mandatory Attribute values.
- Recorded: The registered item contains all Mandatory Attribute values, but the contents may not meet the quality requirements specified in ISO/IEC 11179 and FDR procedures.
- Certified: The registered item has met the quality requirements specified in ISO/IEC 11179 and FDR procedures.
- Standardized: The registered item is established as an item preferred for use in new or updated applications. The "standardized" item may be unique within the registry, or it may be the preferred item among similar items.
- Retired: The registered item is no longer recommended for use in FAA applications.

These statuses are set by the Registrar.

4.2.10.3 Administrative Status. Each data element or other administered item in the FDR has an administrative status that provides information about where the item is in the standardization workflow process. Administrative statuses, which are also set by the Registrar, are:

- Candidate: The need for a standard data element or other administered item has been identified.

[10] Note that while the FDR software is able to test for and ensure uniqueness of names within a context, it is not currently able to test for or ensure uniqueness of definitions. Note also that different names for the same element can still be captured in FDR as "alternate names." In a 11179 registry, Alternate Name is an attribute of every administered item.

- Interim: A proposed data standard is being evaluated, which for NAS data is accomplished by the NIAC Permanent Members. The Interim status ends when the proposed standard has been submitted to the executive level approval body, which for NAS data is the NAS CCB.
- Review: A recommended data standard is under executive level review for approval.
- Final: A recommended data standard has executive level approval for implementation in new application system development projects and in application system upgrades. The approved data standard is "frozen" meaning no changes to the approved data standard are permitted.
- Unassigned: A workflow status has not been established.

4.3 FAA Data Architecture

The FAA Data Architecture represents a high level logical architecture comprised of eight major subject area data models presented in entity-relationship diagram (ERD) notation. The Architecture is a key tool in the FAA data management program, supporting data standardization, data requirements analysis and design in programs and projects, life-cycle management of data as an asset, and data quality initiatives. As it grows, it will become an essential aid to data standardization efforts, helping to highlight shared or common data and key reference tables (value domains) and providing a basis for creating a proposed data standard.

4.4 Data Standardization Requirements Sources

Information necessary to support a specific data standardization requirement should be collected from appropriate sources. These information requirements may be collected from existing information systems' documents, data dictionaries, and data models; functional descriptions; and authoritative sources, such as policy and guidance. Information requirements may include a request to update (modify or retire) existing data standards.

The following are the prime sources of requirements:

- Capital Investment Plan (CIP) – Contains general descriptions of NAS projects.
- Capability Architecture Tool Suite-Internet (CATS-I) – The CATS-I has been developed as a systems engineering tool to help sustain the high level of NAS safety and air traffic services, define new NAS capabilities in partnership with the aviation system users to improve safety, security, and efficiency, and increase understanding of the complexity of the airspace system, its services, and capabilities. Requirements from NAS-SR-1000, the NAS System Requirements Specification document, are incorporated into the **NAS Architecture** and can be accessed via the CATS-I web site.
- Standards and Orders – Various federal and industry standards and orders specify procedures, practices, and protocols for interfacing subsystems.
- Interface Documentation – This includes Interface Requirements Documents (IRD), Interface Control Documents (ICD), and Computer Program Functional Specification (CPFS) documents, as well as other technical documentation describing shareable data in the NAS.

- FAA Enterprise Architecture – Contains information about FAA enterprise requirements in terms of processes, applications, data, and technology. The FAA Enterprise Architecture focuses on mission support and administrative functions of the FAA
- External (Federal, National, and International) Data Standards – Reuse of applicable existing data standards should be considered before creating or modifying a NAS data standard. External Registrars or data stewards should be consulted to identify existing standards within their functional areas. The FDR should also be used to locate adopted external and NAS data standards.

4.5 FAA Metadata Repository

The FAA Metadata Repository or MDR, a key component of the FAA Data Management Policy, is another prime source of requirements. It describes information systems and their data that are in use throughout the FAA. Each of these information systems enables the agency to deliver its essential services (e.g., air traffic services, airport management, aviation security, system safety, certification and regulation, and enterprise management). The MDR's interactive FAA Information Systems Inventory Report contains facts about each system, including owners, customers, hardware and software architecture, mission and function, data exchanged with other systems, and much more.

4.6 Data Modeling Activities and Tools

Data modeling is a technique for formally describing data, its structure, and its relationships. Standards developers are encouraged to use or create a data model in order to see the context of the data they are trying to standardize, to help them understand the primary entities or objects that are involved, and to aid them in naming their proposed standards. An FAA Data Modeling Process document provides guidance on how to use data modeling effectively in relation to the FAA's Data Management Policy and its initiatives on data standards and data architecture. As stated in the document, modeling activities performed during application development should advance the data standardization and integration of data models through:

- Reuse of existing standard data elements and entity definitions within the FAA.
- Submission of standard data elements to the FDR.
- Mapping of legacy data elements available in the MDR to the standard data elements.
- Reuse of standardized data models, such as industry-wide data model patterns.

Methodologies and tools are described in greater detail in the referenced document and include recognized techniques like entity-relationship diagramming and object modeling. Whichever methodology is chosen, accepted notation standards like Integrated Computer-Aided Manufacturing Definition One Extended Data Modeling Technique (IDEF1X) or Unified Modeling Language (UML) that are employed in popular commercial off-the-shelf (COTS) tools should be used.

4.7 Lexicon of Terms

EUROCONTROL Aeronautical Information Management (AIM) is working with FAA under FAA/EUROCONTROL Action Plan 4 to develop a joint internet-accessible lexicon of aviation terms for use in defining aeronautical information exchange standards and in System-Wide Information Management (SWIM) activities. Initial features and functions of the lexicon will be prototyped in FY04. There will be a configuration managed NIAC-like process by which the lexicon will be populated and maintained over time by groups or individuals involved in modeling, data standardization, defining functional requirements, establishing web services, etc.

4.8 Groupware Collaboration Tool

The Collaborative Discussion and Information Management System (CDIMS) is a secure discussion tool that allows NIAC Working Group moderators to effectively conduct encrypted discussions, promote a negotiated settlement and call for votes on proposed items, and archive completed discussions. Participants can log onto the CDIMS Internet portal at their convenience and present their arguments on behalf of their organizations. No special software is required. CDIMS also provides an automated workflow capability in which discussions may be promoted to higher levels of reviewers for approval, disapproval, or action. Discussion status is tracked and statistics captured throughout the course of the discussion process, and Working Groups can use reports generated from the discussions as supporting materials for case files of proposed data standards.

5.0 DATA STANDARDS DEVELOPMENT PROCESS

5.1 Introduction

This chapter addresses the creation and coordination of new data standards, modification of existing data standards, retiring of existing data standards, and the preparation and submission of a data standards case file. Whereas Chapter 2 provided a summary discussion, it is the intent of this chapter to provide detailed discussion of the process. Figure 5 illustrates the process flow, and the subsequent paragraphs will "drill down" to the necessary level of discussion for each step.

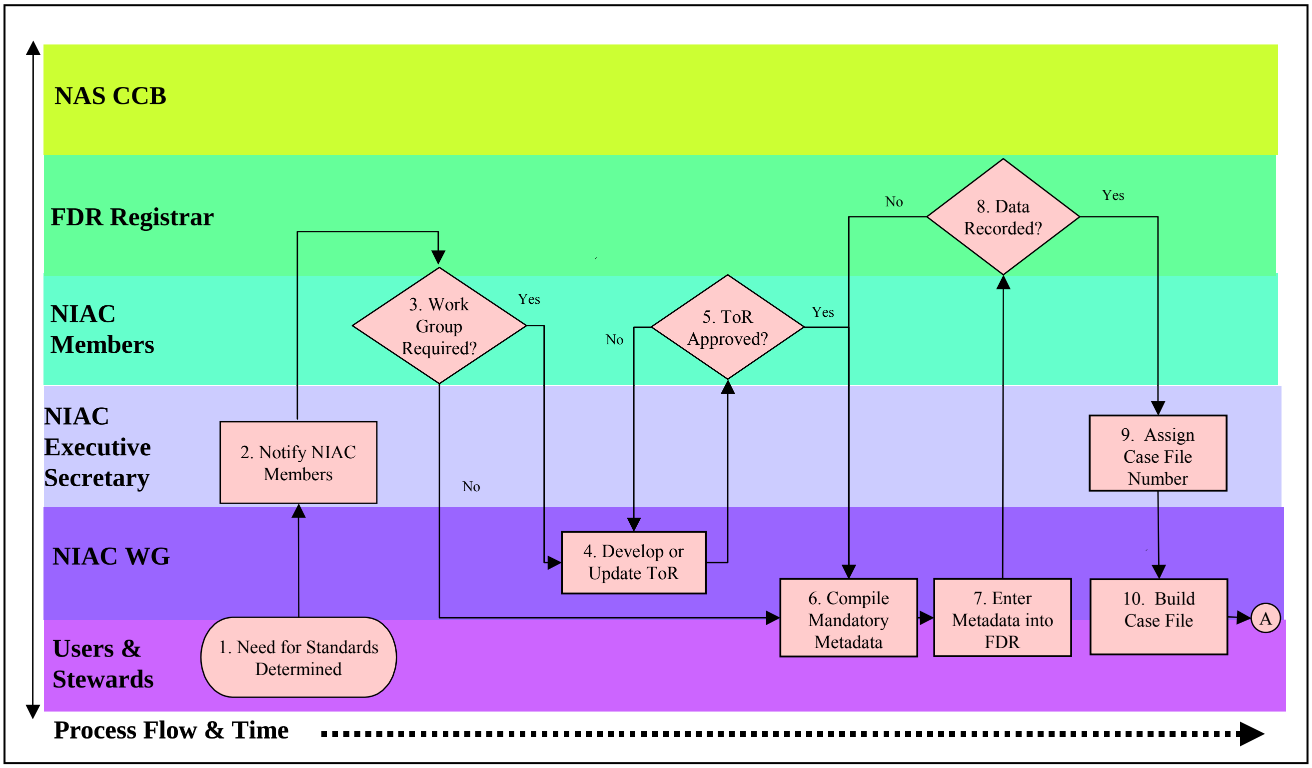


Figure 5: Standards Development Process

The determination of a need for a data standard is a function of good systems engineering practice. Where interoperability risks are high or a cost-benefit assessment is positive, a standard should be a first consideration. In this business environment, a data element or concept typically has a life cycle process that should be considered independent of the data architecture or processing systems that are employed. Good information engineering practices encourage the use of open systems and application-independent data practices to reduce costs and allow for modernization.

5.2 Step 1 – Determining Need for Data Standard

The fundamental rules for determining a need for a data standard are:

- Is the data element in question considered a commonly or widely used item? *In other words, is this data element used across the NAS, between air route traffic control centers (ARTCC) or between facilities? Is it listed in several system data dictionaries?*

- Is it likely that the data element in question is exchanged between different or distributed systems? *An example would be the data in a flight position report: aircraft identification, departure airport, arrival airport, etc.*
- Is this data element a new requirement for a modernization program? *An example would be system specific "new data" like runway threshold latitude and longitude required for the Standard Terminal Automation Replacement System (STARS).*

Primary references that should be consulted to help answer these questions include the MDR, the FAA Data Architecture's Corporate Data Model, and the NAS Architecture tool: CATS-I. If the response to any of these questions is "yes," the individual (data steward or other user of the data element in question) who is initiating this standardization effort should document the findings for their potential utility as case file supporting material, and move to Step 2. In general, the collection and compilation of metadata under the direction of data stewards is encouraged. Though the data element in question may not be ultimately "standardized," the effort to compile and assess the metadata is a valid activity for all data stewards.

The MDR is one source for researching FAA's legacy information systems since it collects a large variety of metadata about each system and provides a number of easily generated detailed reports, including listings of entities and their attributes, which may be used to support the need for establishing a data standard. Other important sources for potential NAS data standards will be any technical documentation such as Interface Requirements/Control Documents (IRDs/ICDs) and Computer Program Functional Specifications (CPFS) documents.

The next objective is to compare the *data element of interest* with metadata of data standards in the FDR, which is easily accessed via the Internet. The best approach for evaluating a new data element against the FDR contents is to compile the following metadata for the *data element of interest*:

- Definition or description of the data element
- Common name of the data element
- Range of values that the data element may assume
- Systems or databases that may employ the data element now or in future
- General classification of the data element.

The initiator should then begin a *comparison search* of the registry by using the search and listing functions of the FDR. This task is generally a discovery effort in which the initiator is expected to assess the contents and determine the similarities of any new finds and the *data element of interest*. The following is the suggested priority of comparison and equation:

1. **Similar or same definition**. If the *data element of interest* and existing registry entries have about the same definition, which describes their purpose, further investigation is clearly warranted.
2. **Similar or close range of permissible values**. If the *data element of interest* and an existing registry entry have nearly the same value domain, further investigation is warranted.

3. **Similar or same name**. If the *data element of interest* and existing registry entries have about the same name, or have the same name in a different context, which suggests similar usage, further investigation is warranted.
4. **Similar or common system usage**. If the *data element of interest* and existing registry entries are used by the same or adjacent installations of the system, further investigation is warranted.
5. **Same classification**. If the *data element of interest* and existing registry entries possess the same classification, there is a basis for continuing the investigation.

In each situation, a continuation of the specific investigation implies that there is a basis for finding a similar, perhaps suitable standard or certified data element for use.

The objective in this analysis is to move toward a decision on a data standard. A refinement of the rules is as follows:

- If there is agreement with comparison item 1 and 2 for the *data element of interest*, then there is a basis for adopting the FDR standard data element for the system or database in lieu of the *data element of interest*.
- If there is agreement with comparison items 3 and 4 for the *data element of interest* with other data elements in the registry, then there is a basis for standardization of the data element of interest.
- If there is agreement with comparison items 4 and 5, then there is a basis for establishing a new standard based upon the *data element of interest* and those data elements found in the FDR.

These rules are offered as general guidance. It is incumbent on the initiator to assess the issues and work with the Registrar to develop a strategy for advancing those data elements under his/her purview toward standard data.

This information and assessment is summarily presented to the NIAC Executive Secretary for coordination and processing.

5.3 Steps 2 and 3 – Assessing Need for a Working Group

The initiator contacts the NIAC Executive Secretary, who notifies the NIAC Permanent Members (Step 2) of the potential standardization effort. The Members may use the following criteria to help determine whether or not a Working Group is required (Step 3):

- Is the *data element of interest* being processed (even singly) related to a larger set of data elements? Is sufficient information available to understand the relationship of the *data element of interest* to a broader formulation? If so, this would suggest wide use and interest, and a Working Group would be a prudent investment of resources. The Members may recommend: 1) starting a new Working Group or 2) adding this item and initiator to an active (standing) Working Group.
- Is the *data element of interest* presented as a part of a large set? The presence of a large group of data elements for standardization suggests a broad impact and investigations will be extensive in

the course of building the case file. If so, this would suggest wide use and interest, and a Working Group would be a prudent investment of resources.

- Is the *data element of interest* presented as part of an ongoing work effort being done under an existing FAA initiative or project? If so, the Members may advise the initiator to use the resources available in that project to develop and coordinate a case file for the proposed data standard.
- Is the *data element of interest* presented as a new version of an existing standard? In this case, the initiator should be familiar with the various interested parties. In this situation, the Members may advise the initiator to either 1) develop and coordinate a case file for the new data element version, or 2) add the data element version to an existing working case file in process by another initiator or another Working Group. In any event, the timing must not materially affect the working case file, now acting as a host to the new data element.

5.4 Step 4 – Developing the Terms of Reference

The determination of need for a Working Group requires either the new development of a formal document called the ToR or that an existing ToR be updated to reflect the new responsibilities being placed on an existing Working Group.

ToR - The format and topical outline of the ToR is shown in Appendix 4.

Working Group Chair - The ToR is normally developed by the individual designated the candidate Working Group Chair. This designation is a collaborative selection, normally done by the NIAC Members and the manager of the initiator organization.

Working Group Membership - The composition of the Working Group is a function of those organizations and individuals who can be considered stakeholders in standardizing the *data element of interest*. Generally, this group of people will be systems engineers and database administrators representing the systems that use the data element or the class of data represented by the data element.

The ToR sets up a "partnering workshop" among those organizations represented. It is not expected to be a lengthy document but simply a work statement that outlines the products, timelines, and commitments.

5.5 Step 5 – Approving the Terms of Reference

The Executive Secretary is responsible for reviewing a prepared ToR for completeness. The format and outline shown in Appendix 4 is the basis for this review. The prepared ToR is then circulated among the NIAC Members. This circulation offers each Member the opportunity to assess and comment on the endeavor described in the ToR. The Members will sign the approved ToR or return it to the author for coordination and resolution of any issues that surfaced during the review.

The Members' signatures formalize the activities and provide notice to the larger community that a standardization effort is authorized. If collaborative efforts are necessary, the ToR is evidence that project should command the necessary resources to fulfill the need.

5.6 Step 6 – Compiling Mandatory Metadata

This step is necessary for gaining an understanding of the *data element of interest* and collecting the information for input into the FDR. As stated in Chapter 4, creation and registration of a potential standard data element requires that certain characteristics of the data element, called metadata, be recorded to clearly describe and define it. A list of this metadata is shown in Appendix 1. The initiator should ensure that these characteristics are stored in the FDR. The discussion[11] that follows is intended to describe the creation and capture of high quality, consistent metadata that meets the requirements of the Registrar.

5.6.1 Understanding the Data Element

The first thing to do is to gain an understanding of the data element. This means answering questions like:

- What kind of data will be stored in this data element?
- Is there a definition or description of the data values?
- Were permissible values or examples of the data provided?
- Will the data values be determined by an arithmetic or statistical procedure?
- What will the data values look like, e.g., are they names or descriptions of things, numbers to be calculated, strings of characters, and numbers that are identifiers?
- How is the data element used in existing applications?

Where documentation is inadequate to fully understand the data element, consult those who represent the source of the data element to get the necessary information.

When examining existing computer systems to find out how the data element is used, do not automatically assume that there will be a one-to-one correspondence between a field in a record and a data element. Data dictionaries may be available for mid- to large-scale systems, and they are a source of descriptive information. However, as systems evolve, fields can become used for multiple purposes under various conditions. When such a situation is detected, the field must be analyzed to understand the data item and to break down complex items into their constituent components. It may be desirable, if not necessary, to declare one or more data elements within a single data field. The reverse situation, where multiple fields correspond to or are necessary to define a single data element, is also possible, though less likely. Appendix 7 contains a discussion of how one group addressed these issues in creating metadata for en route data.

5.6.2 Collect Basic Data Element Information

Begin collecting information on the *data element of interest*. If the initiator prefers to begin compiling metadata off-line rather than enter it directly into the FDR, the Tab A data standard/developer compliance report shown in Appendix 5 may be used as a worksheet to support the input of metadata into the FDR when the work has progressed to the point of registry input.

[11] Some material in this section is adapted from: ISO/IEC PDTR 20943-1.3 *Information technology – Data management and interchange – Procedures for achieving metadata registry content consistency – Part 1: Data elements*, April 2001

While collecting and evaluating the metadata, consider the following:

- Is the data element described as an existing International, National, or FAA standard? *If so, there is good reason to accept the standard for use.*
- Does a data element exist in the FDR or other registries? *If so, research and assessments are already completed to assist in advancing a new data standard.*
- Does the data element have the potential for being reused? *If so, there are probably other interest parties or stakeholders who should participate in the standardization effort.*

The collection process product is a basis for developing the data standards, and the following steps expand and refine the data element information in preparation for registry operations.

5.6.2.1 Data Element Identification (Name)

The initiator should record the common term that identifies or names the *data element of interest*. At this point, it may be something cryptic like ACFT_POS_XYZ, but if this term is often used in FAA applications, then it should be used initially.

Modern naming conventions are useful in removing ambiguity and helpful in communicating use and meaning, especially when the identification process for a data element is initiated. The "old term" may be kept for accountability purposes, but modern conventions must be applied. A set of conventions for naming data elements in the FDR has been adopted; the conventions as well as a detailed description of how to create names can be found in Appendix 2.

Developing the data element definition first helps to develop well-formed names by providing relevant words to use in the name. Briefly, formulation of data element names is accomplished by recognizing the component concepts of the data elements: object class term, property term, and value domain term. An object class term is the name of a kind of "thing." A property term is the name of some information about the kind of "thing." A value domain term is the name for an explicit representational form and interchange format. At least one formulated name must be assigned to a data element. The following data element name structure is shown with the proper case structure and separators between terms:

ObjectClassTerm_PropertyTerm_value-domain-term

Note that the object class term is first, then the property term, and finally the value domain term. The terms are separated by an underscore ("_").

Examples: Employee_Birthday_date-Julian
Employee_LastName_text

Naming is important to the standardization effort. Careful formulation of the names (and other documenting meta-attributes) of data concepts promotes consistency of data element names and helps to prevent development of inappropriate data element names (i.e., different names for the same data element or the same name for different data elements).

If a data element might be adapted to meet a new requirement or if some attributes of an existing data element (e.g., value domain, data element concept, or conceptual domain) might be reused with the new data element, then an efficiency gain can be realized. Content research should include a search of conceptual domains, data element concepts, and value domains as well as data elements to identify attributes that might be relevant to the new data element.

5.6.2.2 Data Element Definition

The definition of the *data element of interest* is important and its composition should be the first step in documenting the data element. This definition may initially come from the data dictionary associated with the data element and application or system. The essential meaning of the data element must be captured in a data element definition. The definition should enable the reader to appreciate the purpose and use of the data element. The aforementioned data naming conventions should have helped the definition development. Appendix 3 describes rules and guidelines for formulating good definitions.

5.6.2.3 Value Domain and Permissible Values

Operational data is frequently thought about in terms of the values that it may assume. Therefore, in compiling the metadata that describes the *data element of interest*, this key information must be noted. The value domain of a data element describes the values that the data element is allowed to have. Appendix 1 contains detailed information about the kind of metadata captured for value domains, such as data type and interchange format.

The interchange format is used to indicate the position of punctuation, symbols, or other editing requirements for the data item value (e.g., YYDDD is the interchange format for Julian date). The value domain is an administered item, which means that administrative data, such as its name, definition, source, steward, any explanatory comments, etc., need to be entered. Domains can be enumerated (i.e., established through a list) or non-enumerated (e.g., specified through a formula, rule, procedure, or reference). Different metadata attributes are used depending upon whether the permissible values are enumerated or non-enumerated. Each enumerated permissible value is associated with a value meaning and value meaning description as described in Chapter 4. Each enumerated permissible value is also entered in the registry with its begin date (i.e., the date when that permissible value became valid for a value meaning in that registry). End dates will also be entered when the permissible value for a value meaning becomes invalid. Value domains for non-enumerated domains must include a *description* of the values that are valid for those domains.

More information concerning how to choose and formulate value domains is included in Appendix 7.

5.6.2.4 Steward Organization

At some point in the standards development, organizational responsibility in the form of a data steward must be declared. It is useful to gather and record information of organizational interest or responsibility for the *data element of interest*.

5.6.2.5 References

References are important to understanding the requirements for the *data element of interest*. Further, building a case file and promoting a new data standard is based upon an understood need that should be available from the references. It is important qualifying information.

5.6.2.6 Usage

Like references, understanding the applications or systems that use the *data element of interest* is important. These applications and systems must be documented as they will lead to other interested parties with unique requirements that must be understood in order to promote an application-independent data standard. It is important to understand the specific contexts in which the data is used now or is planned to be used in future.

5.7 Step 7 – Entering Metadata in the FAA Data Registry

The initiator or person(s) who will be entering the metadata into the FDR should access the FDR Portal and apply for a user account with the Registrar. Once the account is established, the initiator can conduct transactions with the registry tool. Explicit directions for entering metadata into FDR can be found in the FDR on-line help and FDR Users Guide. FDR training is also offered periodically by the Office of Information Services.

Experience has shown that creating and entering an associated conceptual domain and data element concept (assuming these do not already exist) for the data element prior to entering the data element in FDR is most efficient. As mentioned earlier, Appendix 7 contains case histories, lessons learned and other advice that may be helpful.

5.8 Step 8 – Updating the Registration Status

As explained in the previous chapter, all potential standards entered in the FDR have an Administrative Status, which explains where the candidate element is in the standardization workflow process, and a Registration Status, which reflects the level of quality and utility of its metadata in the FDR. At various points in the process and always in coordination with the initiator, the Registrar assigns these statuses appropriately. Some of the metadata items in Appendix 1 are denoted as "mandatory" and the initiator should know that all of the mandatory fields must be completed in the FDR for the Registrar to qualify the Registration Status of the *data element of interest* as "recorded." (The default or lowest Registration Status is "incomplete.") As the candidate element passes through the succession of quality reviews by NIAC and the NAS CCB, it will achieve "certified" status and ultimately become "standardized." The "standardized" data element is the preferred data element to be used for data sharing to ensure consistent representation and understanding of the data being communicated.

5.9 Steps 9 and 10 – Preparing the Case File

If a Working Group has been tasked with initiating the proposed data standard effort, the Working Group Chair will collaboratively discuss and resolve technical and data stewardship assignment issues within the Working Group. When these issues are resolved, the Working Group Chair or individual initiator (data steward or other user) then prepares a case file package containing the proposed standard(s) with supporting materials deemed relevant by the initiator. The initiator requests a *case file number* (Step 9) from the NIAC Executive Secretary and coordinates with the Registrar to promote the Administrative Status of the proposed data standard(s) from “candidate” to “interim,” which means that it is ready for NIAC review.

When the proposed data standard(s) have been documented (Step 10) and registered as described above, the initiator or Working Group Chair is ready to proceed to the approval phase. This phase is described in the next chapter.

6.0 DATA STANDARDS APPROVAL PROCESS

6.1 Introduction

This chapter addresses the technical and cross-functional review and approval of data standards using the NCP process. This process is illustrated in Figure 6.

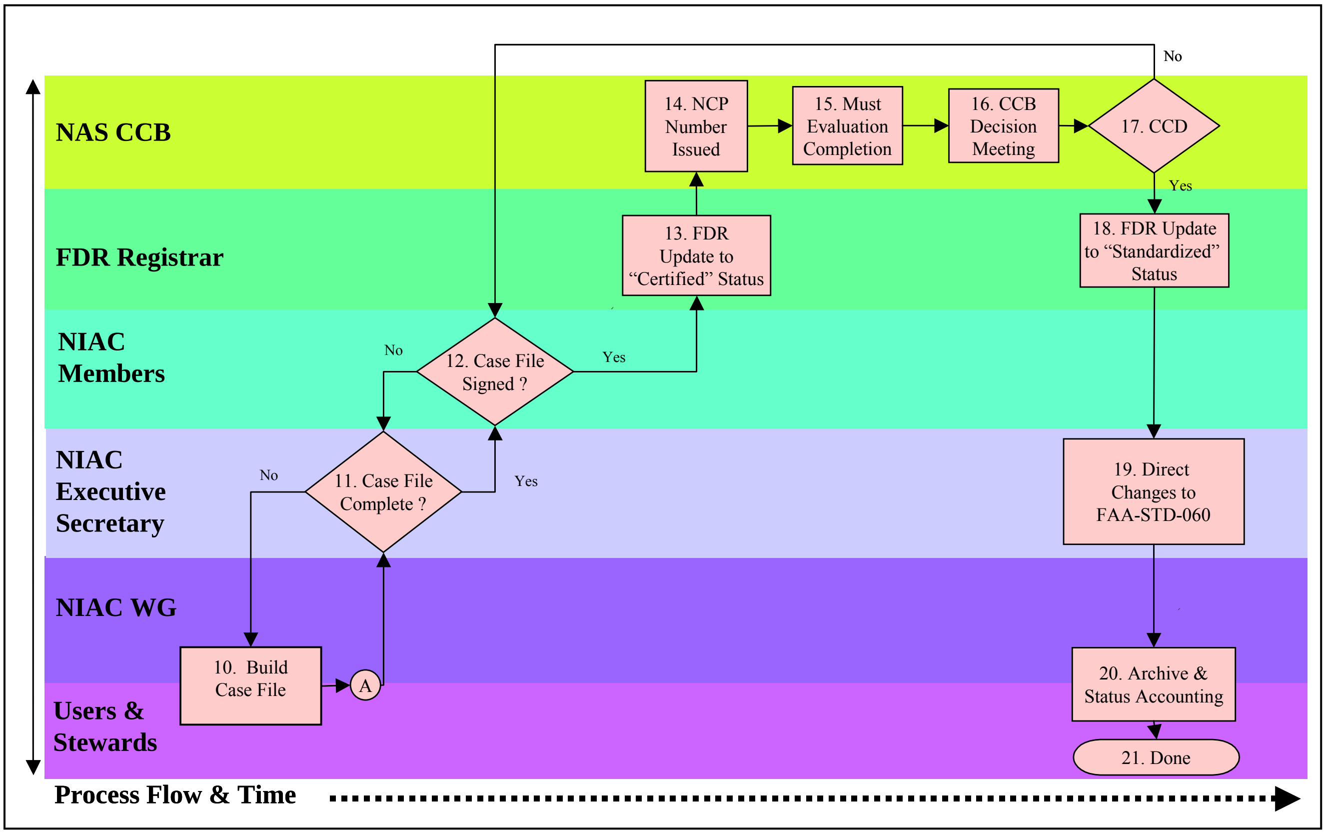


Figure 6: Standards Approval Process

6.2 Step 11 – Reviewing the Case File for Completeness

As described in the previous chapter, the Working Group Chair or individual initiator (data steward or other user) prepares a case file package containing the proposed standard(s) with supporting materials deemed relevant by the initiator. The initiator then forwards the case file package to the NIAC Executive Secretary who reviews this package for completeness and works with the initiator to obtain any missing information. Once it has been determined that the case file package is complete, notification is made to the initiator (also known as the case file originator for NAS CCB purposes), and the case file package is distributed to the NIAC Permanent Members for pre-screening review.

6.3 Steps 12 and 13 – Pre-Screening the Case File

The results of the NIAC Members' technical review (Step 12) will be provided to the case file originator. Any comments that have been produced as a result of this review must be addressed and resolved by the case file originator. The consolidated result of the pre-screening review will be submitted to the Members for final signature and recommendation to NAS CCB. Once the case file has been signed by the Members, the Administrative and Registration Statuses of the candidate data elements in the FDR are updated to "review" and "certified" respectively (Step 13), and the case file is submitted to the Central Configuration Management Control Desk for processing.

The pre-screening review ensures that the candidate data standards are represented uniformly with a NAS perspective. The pre-screening review accomplishes the following:

- Ensures that the candidate entities and data elements and required metadata are clear, meaningful, and consistent with cross-functional area missions, objectives, and information requirements.
- Validates that the candidate entities and data elements are represented uniformly with a NAS perspective so that they can be interpreted consistently.
- Validates that the entity relationships accurately reflect business rules that are implemented uniformly with a NAS perspective.
- Provides the functional community with the opportunity to review the proposals and determine the impact of candidate standards on current implementations.
- Ensures data requirements are represented using as general terminology as possible.

6.4 Steps 14 through 17 – Evaluating the NAS Change Proposal

The Central Configuration Management Control Desk receives the completed signed case file package from the NIAC Executive Secretary. Once it has determined that the case file package meets the NAS Configuration Management criteria, the case file is assigned a NCP number (Step 14). The NCP is forwarded to the NAS CCB Configuration Management Lead and prepared for distribution to NAS CCB permanent members and other subject matter experts for a formal review (Step 15). Comments that are produced as a result of this review are coordinated through the NIAC Executive Secretary with the case file originator for resolution. **All comments must be addressed and resolved prior to CCB decision**. The case file originator will formally present the NCP at both the NAS CCB pre-brief meeting and the NAS CCB formal meeting (Step 16). Upon approval of the NCP, a CCD is issued (Step 17).

6.5 Steps 18 through 20 – Implementing the Configuration Control Decision

A signed CCD records the decision of the NAS CCB and outlines the implementation actions, such as the following:

- Update the Administrative and Registration Statuses of the newly approved data elements in the FDR to "final" and "standardized" respectively (Step 18).
- Publish the new data standard and provide hard copies to the Document Control Center, which includes updating the list of approved individual data standards maintained in Appendix C of FAA-STD-060 (Step 19).
- Maintain the FDR, including retiring the previous versions of the new individual standards, if any, and updating the FAA Data Architecture's Corporate Data Model, as appropriate (Step 20).

6.6 Modification to Existing Data Standards

Modifications to approved NAS data standards will be processed in the same manner as for new data standards. These modifications will be entered in the FDR as developmental versions of the existing approved NAS data standard. If the modification is approved, the superceded NAS data standard will be retired, and the Registrar will update the FDR appropriately.

6.7 Periodic Review of Data Standards

6.7.1 The Registrar will run periodic FDR status reports to assist the NIAC Members in determining appropriate actions.

6.7.2 Once a year or as requested by NIAC, the Registrar will review all developmental and candidate data standards that have not been registered and have remained static for longer than three years with no revisions or modifications. The Registrar will inform the NIAC Executive Secretary and the Members of the review results. If NIAC approves, these unregistered data items will be removed from the FDR and their steward or initiator notified.

APPENDIX 1. METADATA REQUIREMENTS

The metadata items needed for documenting NAS data standards are listed in the following table. An "X" in column two means that this metadata must be supplied in order to register a data element in the FAA Data Registry. Metadata entries drawn from two ***fictitious*** data elements, one with an enumerated value domain and one with a non-enumerated value domain, are shown in column four for illustrative purposes. The metadata items included in the table are those of primary interest to the user; for more information on other registry-specific metadata, see the FDR.

Metadata		Definition	Example	Example
Administered Item Type	X	The type of data component as managed in the FDR. Item types include data element, value domain, data element concept, conceptual domain, object class, property, and classification scheme.	Data Element	Data Element
Preferred Name (a.k.a. Name in FDR entry screens and Preferred Name in FDR search)	X	A single or multiple word meaningful designation assigned to a data element or other administered item constructed in accordance with the FDR naming convention. This name is unique within a single registry context.	Airport_Location_ identifier-ICAO	Airport_LobbyTemperature_ degrees-Celsius
"Long Name" (a.k.a. Alternate Name in FDR search screens)		A separate and inconsistently labeled attribute in FDR, it should be treated as simply another Alternate Name with no special significance. It may be used to hold abbreviated or shortened names, as in the examples shown here.	arprt_lctn_idntfr-ICAO	arprt_lbytmprtr_dgrs-cls
Alternate Name(s)		Single or multi-word designation for a data element or other administered item that differs from the Preferred Name but represents the same data element or administered item. Alternatively, the synonymous name(s) by which a data element is known in this or other application environments or contexts.	International Aerodrome Location Indicator	LOBBYTMP
Alternate Name Type		The type of an alternate name as designated in the FDR, e.g. synonym, abbreviation, XML tag, etc.	Synonym	Legacy Name
Alternate Name Context		The context in which an alternate name is used or has meaning.	ICAO	Training

Metadata		Definition	Example	Example
Alternate Name Language		The identity of a language in which an alternate name is expressed. (Note: this includes programming languages.)	English	English
Data element definition	X	A natural language textual statement that expresses the essential nature of the data element and permits its differentiation from all others. NOTE: FDR has an additional attribute called Alternate Definition that should not be used.	The landing facility location identifier that was created in accordance with the International Civil Aviation Organization (ICAO) rules, assigned to the airport, and must be employed in filing of international flight plans conducted under the ICAO rules.	The indoor temperature of the lobby or foyer of an airport, expressed in degrees Celsius.
Context	X	The domain of discourse within which a data element's or other administered item's Name is valid. Alternatively, a designation or description of the application environment or discipline in which a data standard is applied or originates from; the scope in which the subject item has meaning. A *Context* may be a business domain, an agency, an information subject area, an information system, a database, file, data model, standard document, or any other environment.	FAA	TRAINING
Context Definition		A natural language textual statement that expresses the essential nature of the context, and permits its differentiation from all other contexts.	FAA standard data	A context used for FAA training sessions
Data Identifier	X	A language independent identifier of a data element or other administered item that, taken together with its Version, uniquely identifies it in the FDR.	1694	2901
Version	X	An identification of the latest or previous update in a series of evolving specifications for a data element or other administered item within the FDR.	1	1

Metadata		Definition	Example	Example
Classification Scheme		A reference to a scheme for the arrangement or division of objects into groups based on characteristics that the objects have in common, e.g., origin, composition, structure, application, and function. Examples of schemes include taxonomies, thesauri, etc.	NAS Data Classification Scheme	NAS Data Classification Scheme
Classification Scheme Item		A component of content in a classification scheme; this may be a node in a taxonomy or ontology, a term in a thesaurus, etc.	5.2.1 – Facility Identification	5.1.5 – Airport Passenger Facilities
Effective Begin Date		The date that a data standard is approved for use.	01/18/2002	02/19/2003
Effective End Date		The date that a data standard is no longer approved for use, i.e., retired.	01/18/2007	N/A
Data Concept (a. k. a. Data Element Concept)	X	A concept that can be represented in the form of a data element, described independently of any particular representation.	Airport_Location	Airport_LobbyTemperature
Data Concept Definition	X	A natural language textual statement that expresses the essential nature of the data concept and permits its differentiation from all others.	The notion of the location or site of an airport.	The indoor temperature of the lobby or foyer of an airport.
Object Class		A set of ideas, abstractions, or things in the real world that can be identified with explicit boundaries and meaning and whose properties and behavior follow the same rules.	Airport	Airport
Property		A characteristic common to all members of an object class.	Location	LobbyTemperature
Value Domain	X	A named set of permissible values, enumerated or non-enumerated. NOTE 1: The value domain provides representation, but has no implication as to what data element concept the values may be associated with nor what the values mean. NOTE 2: The permissible values may either be enumerated or expressed via a description.	identifier-ICAO-ALPHA(4,4)	degrees-Celsius-ZNUMBER(1,2,2)

Metadata		Definition	Example	Example
Value Domain Definition	X	A natural language textual statement that expresses the essential nature of the value domain and permits its differentiation from all other value domains.	The set of 4-letter codes assigned by ICAO that uniquely identify aerodromes and facilities.	Measures of atmospheric temperature at the earth's surface expressed as degrees Celsius to the nearest hundredth of a degree.
Value Domain Type	X	An indicator as to whether the value domain is enumerated (specified through a list of at least two individual permissible values) or non-enumerated (specified by a range of numbers, set of rules, formula, procedure, etc.)	Enumerated	Non-enumerated
Non-Enumerated Value Domain Description		A description of a value domain that contains a wide range of data values that cannot be listed, i.e., is not an enumerated value domain. The ranges can usually be described by a set of rules. Example (for "text" value domain): "A string of alphanumeric characters (formatted or unformatted)."	N/A	The explicit value domain consists of quantities measured in degrees Celsius represented by decimal numbers ranging from -91.00 to 60.00.
High Value		The highest value in the range of permissible values for data elements or value domains with representational forms of quantity.	N/A	60.00
Low Value		The lowest value in the range of permissible values for data elements or value domains with representational forms of quantity.	N/A	-91.00
Unit of Measure		A single or multiple word designation assigned to a measurement framework for data elements or value domains with representational forms of quantity, e.g., watt, mile, miles-per-hour, ton, ampere. Note: this meta-attribute applies only to quantity-oriented data elements.	N/A	Degree Celsius

Metadata		Definition	Example	Example
Unit of Measure Definition		A statement that expresses the essential nature of a measurement system associated with a data element or value domain and permits its differentiation from all other units of measure, e.g., ampere = “measure of electric current.” See FDR for additional information. Note: this meta-attribute applies only to quantity-oriented data elements.	N/A	Celsius temperature [K]
Unit of Measure Precision		The degree of specificity for a Unit of Measure, expressed as the number of decimal* places to be used in the data element’s values. *Precision may be reported in non-decimal units, e.g., in eighths, sixty-fourths, etc. Decimal is assumed unless otherwise specified.	N/A	2 decimal places; nearest hundredth of a degree
Data Type	X	A set of distinct values, characterized by properties of those values and by operations on those values, for example the category used for the collection of letters, digits, and/or symbols to depict values of a data element determined by the operations that may be performed on the data element. Examples of data types are bitmap, Boolean, real, integer. See FDR for additional information.	Letter String	Decimal
Data Type Definition		A statement that expresses the essential nature of a data type associated with a data element’s value domain and permits its differentiation from all other data types.	Finite sequences of uppercase letters A through Z	The set of real numbers with an exact fractional part
Maximum Length		The maximum number of storage units (of a corresponding data type) needed to represent a data element or value domain. The storage units are considered to be ASCII characters unless otherwise specified.	4	6

Metadata		Definition	Example	Example
Minimum Length		The minimum number of storage units (of a corresponding data type) needed to represent a data element or value domain. The storage units are considered to be ASCII characters unless otherwise specified.	4	4
Interchange Format (a.k.a. Format)		A single or multiple word designation assigned to a form of interchange for a data element that permits its differentiation from all other interchange formats, e.g., YYYYMMDD for calendar date, where YYYY represents a year, MM represents an ordinal numbered month in a year, and DD represents an ordinal numbered day of a month.	AAAA	(-)(N)N.NN
Character Set		A collection of graphic symbols (e.g., letters or glyphs) used in writing or printing, in which each character in the collection is assigned a numeric index in a particular coding table. Examples of character sets include US (7-bit) ASCII, EBCDIC, Unicode.	US 7 ASCII	Unicode
Permissible Values		The set of representations of allowable instances of an enumerated value domain of a data element represented according to the interchange format, data type, and maximum length constraints. The set of representations of permissible instances is associated with one set of **value meanings**. The set can be specified by name (e.g., Postal U.S. State Codes), reference to a source, enumeration of the instances' representations (e.g., AL, AK, etc.), or rules for generating the instances.	"ICAO Identifiers" Alternatively, PANC PHNL Etc.	N/A

Metadata		Definition	Example	Example
Value Meaning		A statement that expresses the essential nature of a set of permissible values without a specific representation and permits its differentiation from all other sets. The set can be specified by name (e.g., the states of the United States), or enumeration of the meanings of each permissible value (e.g., the state of Alabama, the state of Alaska, etc.).	"ICAO 7910, the authorized source for ICAO aerodrome names and facilities" Alternatively, Anchorage International Airport, Honolulu International Airport, etc.	N/A
Conceptual Domain	X	A set of value meanings of a data concept, expressed without representation. NOTE: The value meanings may either be enumerated or expressed via a description.	identification-facility	measure-temperature
Conceptual Domain Definition	X	A natural language textual statement that expresses the essential nature of the conceptual domain and permits its differentiation from all other conceptual domains.	Identification of a facility for reference purposes, usually for air traffic control.	The degree of hotness or coldness of anything, usually measured with a thermometer.
Dimensionality		An expression of measurement without units; a quantitative description of phenomena where physical or non-physical quantities have been grouped together into categories of quantities which are mutually comparable and have the same set of permitted functions. Examples of physical categories are: linear measure, area, volume, mass, velocity, time duration. Examples of non-physical categories are: currency, quality indicator, color intensity.	N/A	Temperature
Example Instance		A representative sample of a typical instance of the data element or other administered item, if it can be represented as a printable character string.	KDCA	25.30
Document Name		The name of a document pertinent to a data element or other administered item.	FAA Order 7350.7F Location Identifiers	N/A
Document Type		The type of a document pertinent to a data element or other administered item.	FAA Order	N/A
Document Language		The kind of natural language used in a document.	English	N/A

Metadata		Definition	Example	Example
Document URL		The Internet Uniform Resource Locator (URL) where the document may be found.	http://www.faa.gov/atpubs/index.htm	N/A
Document Text		An abstract or summary of the document or the actual text of a short document.	List of landing facility location identifiers created in accordance with ICAO rules	N/A
Comments		Additional explanatory information.	Continental United States airport codes begin with 'K'. Alaska and Hawaii airport codes begin with 'P'.	This element is no longer being used by NAS systems.
Related Administered Item		An administered item that has a special relationship or association with the subject administered item.	N/A	Airport_EnvironmentalConditionReport_text
Relationship		The nature of the association between the subject administered item and the related administered item, e.g., part of, similar to, etc.	N/A	Is component of
Steward Organization		The organization or unit within an organization that is responsible for the content and quality of the meta attributes documenting a data element or other administered item in the FDR.	Aeronautical Information Division, ATA-100	Systems Architecture, ASD-100
Submitter Organization		The organization or unit within an organization that has submitted a data element or other administered item for addition, change, or cancellation/withdrawal in the FDR.	Office of Information Services/CIO, AIO-300	Systems Architecture, ASD-100

Metadata		Definition	Example	Example
Registration Status (Entered by Registrar)	X	The registration status of a data element or other administered item. Values are: **Incomplete**: The registered item does not contain all Mandatory Attribute values. **Recorded**: The registered item contains all Mandatory Attribute values, but the contents may not meet the quality requirements specified in ISO/IEC 11179 and FDR procedures. **Certified**: The registered item has met the quality requirements specified in ISO/IEC 11179 and FDR procedures. **Standardized**: The registered item is established as an item preferred for use in new or updated applications. The "standardized" item may be unique within the registry, or it may be the preferred item among similar items. **Retired**: The registered item is no longer recommended for use in FAA applications. [**Rejected**: The registered item has been rejected by the Registrar. NOTE: conventions for use of this status level have not been determined.]	Standardized	Retired

Metadata		Definition	Example	Example
Administrative Status (a. k. a. Workflow Status) (Entered by Registrar)	X	The administrative status of a data element or other administered item. Valid values: **Candidate**: The need for a standard data element or other administered item has been identified. **Interim**: A proposed data standard is being evaluated, which for NAS data is accomplished by the NIAC Permanent Members. The Interim Status ends when the proposed standard has been submitted to the executive level approval body, which for NAS data is the NAS CCB. **Review**: A recommended data standard is under executive level review for approval. **Final**: A recommended data standard has executive level approval for implementation in new application system development projects and in application system upgrades. The approved data standard is "frozen" meaning no changes to the approved data standard are permitted. **Unassigned**: A workflow status has not been established.	Final	Final
Case File Number		Identifier assigned by the NAS CCB.	IO300-NAS-001	SD100-NAS-666

Metadata		Definition	Example	Example
Case File Status (Entered by Registrar)		The status of the case file that supports establishment of one or more data standards. Values are: **Proposed Change**: This case file is being developed for one or several data elements or other administered items to be standardized. Completed case file will be forwarded to NIAC for review. **Prescreening**: NIAC is reviewing this case file. NIAC Permanent Members will sign case file and forward to Central Control Desk. **Must Evaluation**: Central Control Desk has assigned a NAS Change Proposal number to this case file and has forwarded the NCP to NAS CCB Configuration Management for processing. NCP has been distributed for review to all permanent members of the CCB. **Pending Decision**: NAS Change Proposal review has been completed and all comments resolved, and a draft Configuration Control Decision is being prepared for NAS CCB Co-Chair signature. **Implementation**: Configuration Control Decision has been signed by NAS CCB, and implementation actions specified in the CCD are being carried out. **Closed**: Configuration Control Decision actions have been completed. **Withdrawn**: Originator has withdrawn this case file. An originator can withdraw the case file/NAS Change Proposal at any time before the Configuration Control Decision has been signed.	Closed	Closed

APPENDIX 2. NAMING CONVENTIONS AND GUIDANCE

1.0 Introduction

Conventions and guidance for assigning preferred names to data elements and their associated (component) administered items, as well as the use of alternate names for these items, are described in this Appendix. These conventions are consistent with principles of the ISO/IEC 11179 standard, *Metadata Registries*, Part 5, *Naming and Identification Principles*.

The preferred name is a descriptive name that reflects the business meaning of the data element or component. The preferred name is a formalized synopsis of the data element's definition and representation. Other names, called alternate names, for that data element or component may also exist; an example would be an abbreviated name which is used primarily as a physical name (also referred to as internal, access, or symbolic name) in a database or programming environment. Alternate names are discussed in Section 6 of this Appendix.

The preferred name should be formulated after the definition development for the data element or administered item in order to determine appropriate words for use in the preferred name.

In addition to data elements, these conventions also apply to administered items which are components of a data element (data element concept, object class, property, and value domain).

2.0 Purpose

The purpose of this Appendix is to provide specific guidance to follow when constructing names for data elements and their component administered items that are to be entered into the FAA Data Registry (FDR). Using these conventions will provide consistency to the names of data contained in the FDR and comply with naming principles specified in ISO/IEC 11179, Part 5. Such names are readily recognizable nationally and internationally in any community with an ISO/IEC 11179 compliant registry.

Other data naming conventions are being applied within the FAA for specific purposes, such as those specified in the Air Traffic Services National Data Center Metadata Management and the National Aviation Safety Data Analysis Center Lexicon of Naming Standards documents. Names constructed under such conventions can become alternate names for data that is entered into the FDR.

3.0 Scope

These conventions apply only to data elements and their components that are to be entered into the FDR. These conventions can be applied in naming data in other data constructs (such as in the FAA Metadata Repository, data models, or specific applications) where it is useful to do so.

4.0 Structure of Data Element Names

A data element is a formalized **representation of information** (fact, proposition, or observation) **about something** (person, place, process, thing, concept, association, or event). A data element representation may be character-based, graphic, imagery, sonic, or other complex form.

A data element name is a composite of three components: object class term, property term, and a value domain term. The center column of Figure A2-1 illustrates these three components. An object class (e.g., person) is an abstraction of a real world entity (e.g., the person named Smith). A property (e.g., a particular kind of day, called birthday) is an abstraction of a type of information about the real world entity (the birth event of this particular Smith). A value domain is an abstraction of the physical form of that information (in this case: date, in ANSI X3.30 representational form, YYYYMMDD). Referring to Figure A2-1, the data element illustrated is “employee birthday date.” An instance of this data element is “19450207,” representing the 7 February 1945 birthday of some person named “Smith,” in accordance with the ANSI X3.30 standard.

A data element concept refers to the essential meaning of the data element without any implementing value domain representations, in this case “employee birthday.” Such a data element concept may be combined with appropriate value domain terms to specify different data elements, e.g., employee birthday may be combined with “code” to form the data element “employee birthday code,” where the explicit value domain for code is defined as:

employee birthday code	**birthday range**
“1”	before 1900
“2”	1900-1949
“3”	1950-2000
“4”	after 2000

An instance of that element would be “2”, identifying the range in which Smith’s birthday falls. Still another element “employee birthday Julian date” might represent the same concept in the form YYDDD, e.g., “45038”. Use of data element concepts promotes standardization of data elements.

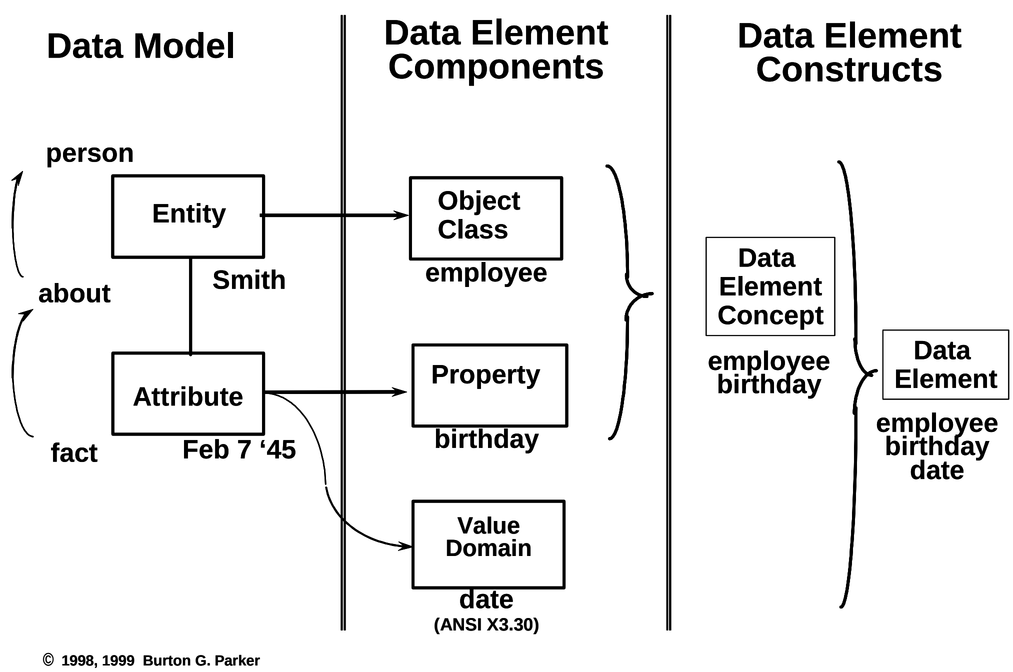


Figure A2-1: Data Element Structure

5.0 Logical Data Element Naming Guidelines

Formulation of data element names is best accomplished by first formulating the names of the administered items associated with the data elements: object class term, property term, and value domain term. Each of these terms consists of a primary word with, optionally, one or modifier words. An object class term is the name of a kind of "thing." A property term is the name of some information about the kind of "thing." A property is sometimes referred to as "attribute," though in common Computer-Aided System Engineering (CASE) tool usage an attribute typically combines the property and value domain. A value domain term is the name for an explicit representational form and format. Careful formulation of the names (and other documenting meta-attributes) of data elements and their associated administered items promotes consistency of data element names and helps prevent development of inappropriate data element names (i.e., different names for the same data element or the same name for different data elements).

A number of general guidelines apply to all preferred names. The use of spaces, prepositions, and conjunctions is not recommended in preferred names. Although FDR allows the use of all characters from the US ASCII character set, punctuation marks and other symbols except for periods, underscores, parentheses, and hyphens are also not recommended for inclusion in preferred names. Primary words used in the preferred name are nouns. Abbreviations and acronyms are not recommended for use in the preferred name unless required to keep the name within maximum length parameters or if they are commonly used in the domain of discourse. When abbreviations or acronyms are used in the preferred name, they should be spelled out in the definition of the data element or data element component.

5.1. Object Class Terms

An object class term indicates the type of "thing" relevant to the data element. An object class is a person, place, process, thing, concept, association, or event about which information must be recorded.

The structure of the object class term of a data element name is

ObjectClassTerm

The object class term is a concatenation of one or more words that communicates the essence of the object class. The words in the term are in initial capital letters with no spaces or special characters.[12] The maximum length of an object class term should ordinarily be no more than 60 characters. Examples: Employee, NavigationalAid.

A potential source of object class names is the FAA Data Architecture which contains hundreds of entities and their definitions. Individuals involved in the creation and naming of data elements and their component parts are encouraged to draw from this source whenever possible.

5.2 Property Terms

[12] Note: prior versions of the Naming Conventions required the first word in the term to be in all capital letters with subsequent words in initial capital letters, e.g., NAVIGATIONALAid. No effort is envisioned at this time to change the names of existing items registered in FDR that use the earlier convention.

A property term reflects the relevant information in the data element, i.e., the "information of interest" about the "thing". The information of interest may be a fact, proposition, or observation about the object class.

The structure of the property term of a data element name is

PropertyTerm

The property term is a concatenation of one or more words that communicates the essence of the property. The words in the term are in initial capital letters with no spaces or special characters. The maximum length of a property term should ordinarily be no more than 60 characters. Examples: Birthday, MarriageDay.

5.3 Value Domain Terms

A value domain term indicates, unambiguously, the way in which the values of a data element are represented.

The structure of the value domain term of a data element name is

value-domain-term

The value domain term is a concatenation of one or more words that communicates the essence of the value domain. The first word is the basic value domain name (also referred to as representation class name). Subsequent qualifier words, such as unit of measure for quantity-oriented value domains, will uniquely characterize the value domain and are separated by a hyphen ("-"). Acronyms are permitted after the first word to make the value domain explicit, provided that such acronyms are in common usage. The maximum length of the value domain term should ordinarily be no more than 60 characters. Examples: date-Julian, text-Cyrillic.

Because of the complexities involved in ensuring unique value domain names, additional guidance is given in **Attachment 1**. Recommended representation class names are provided in **Attachment 2.**

5.4 Data Element Name Format

Data element names consist of an object class term, a property term, and a value domain term.

The structure of a data element name is

ObjectClassTerm_PropertyTerm_value-domain-term

with the object class term first, then the property term, followed by the value domain term. The terms are separated by an underscore ("_"). Examples: Employee_Birthday_date-Julian, Employee_LastName_text-Cyrillic.

5.5 Data Element Concept Name Format

Data element concept names consist of an object class term and a property term.

The structure of a data element concept name is

ObjectClassTerm_PropertyTerm

with the object class term first, followed by the property term. The object class term and property terms are separated by an underscore ("_"). A data element concept can be used with alternative value domain terms to develop different data elements, e.g., combined with explicit value domains such as "text" or "code." Examples of a data element concept term: Employee_Birthday, Employee_LastName.

6.0 Alternate Names

Alternate names are defined as single or multi-word designations for a data element or other administered item that differ from the preferred name but represent the *same* data element or administered item (i.e., they are not the names of other items with similar or slightly different definitions). Alternate names are the synonymous name(s) by which the item in question is known in this or other application environments or contexts. In FDR, an alternate name has associated attributes as follows:

ATTRIBUTE:	ATTRIBUTE DEFINITION:
Alternate Name Context	The context in which an alternate name is used or has meaning.
Alternate Name Type	The type of an alternate name as designated in the FDR, e.g. abbreviation, legacy name, synonym, XML tag, etc.
Alternate Name Type Description	A statement describing the nature of a particular alternate name type as listed above.
Alternate Name Language	The identity of a language in which an alternate name is expressed, e.g. French, XML. (Note: this includes programming languages.)

Conventions for formulating an alternate name depend on the type of name it is and the context in which it is used; that is, the conventions and guidance for assigning preferred names discussed in Sections 1 – 5 above do not apply to alternate names. Conventions for formulating XML tags will be included in future versions of this NAS Data Standardization Procedures document.

Attachment 1: Additional Value Domain Naming Guidance

1. Background

The FAA Data Registry is based on the ISO Standard 11179, *Metadata Registries*. In 11179, a Data Element (DE) is an administered item consisting of two other administered items, a Data Concept (DC) and a Value Domain (VD). The DC is itself made up of two other administered items, an Object Class and a Property.

The intent of splitting the DE into its DC and VD is to divorce a DE from its representation. This is a basic tenet of 11179 and allows us to relate two DE's that mean the same thing conceptually but are represented differently, which helps us translate between and eventually reconcile the two elements. However, this causes extra overhead in the FAA Data Registry (FDR) since any given data element requires both a DC and a VD record. The number of DC and VD records maintained for N data elements falls somewhere between a theoretical lower limit of N+1 (all DE's share exactly one VD) to an upper limit of 2N (no two DE's have the same VD). *To keep that number as low as possible* while still meeting the intent of 11179, it has to be relatively simple for us to search for and find existing VD's that we can reuse so that we do not create new ones unnecessarily.

2. Making Value Domain Names Descriptive as well as Unique

The naming convention constructs a data element name this way:

ObjectClassTerm_PropertyTerm_value-domain-term.

The convention describes the value domain term as a concatenation of one or more words in which the first word is the basic VD name or "core term" (see **Attachment 2**), augmented by qualifier words if needed (such as unit of measure for quantity-oriented VD's), with the words to be separated by hyphens.

However, the convention is limited in that it does not help us choose qualifier words for creating names that not only distinguish among similar VD's but also describe the VD's nature meaningfully. For instance, if a DE called **Employee_LastName_text** is represented as a 60-character text field and **Employee_StreetAddress_text** is a 30-character text field, each DE requires a different VD because it is the VD that contains the Maximum Length attribute. The VD's cannot both be named "**text**" since names must be unique (within a particular context), so what should the qualifier words be?

Recent agreements to exchange aeronautical information between EUROCONTROL and FAA using their aeronautical information exchange model, AIXM, present us with a solution to this difficulty. AIXM has a convention for defining constructs they call "predefined data types", which are somewhat like our representation class terms. [Note: they are not classic data types since they include interchange formats.] Because the data types are geared toward aeronautical data, they appear to be useful terms to include in VD names. The AIXM data type convention is reprinted as **Attachment 3**.

It should be emphasized that the inclusion of AIXM data types in VD names poses a reasonable solution to the twin problems of ensuring uniqueness in VD names and easily recognizing a particular VD in a list of similar VD's. Including the AIXM data type is especially useful when the *author is aware of existing or potential variations on the VD that are or could become FDR entries. Otherwise, including the AIXM data type is less necessary. Therefore its inclusion is* ***recommended*** *but not* ***mandatory****.*

3. Value Domain Naming Guidance

First, a brief review of what is inside a VD is important to ensure understanding of the issues and recommended practices.

A VD contains certain attributes in addition to the usual attributes such as name, definition, comments, etc. shared by all FDR administered items. VD-specific attributes include **Data Type/Data Type Description**, **Interchange Format**, and **Maximum Length**, to list the more important ones. Other attributes depend on whether the VD is *enumerated* or *non-enumerated*.

Enumerated VD's consist of a finite list (or the name of a list) of **Permissible Values** and **Value Meanings**. An example VD is the list of all US State two-letter codes and names.

Non-enumerated VD's consist of a wide range of data values that cannot be listed and are instead described by a set of rules. Non-enumerated VD's contain the attributes of **Non-Enumerated Description**, **Unit of Measure**, **Low Value**, **High Value**, as well as other attributes. An example VD is the set of temperatures in the range of -90.00 to 60.00 degrees Celsius.

4. Guidance for Naming Enumerated Value Domains

Create a meaningful name for the set of permissible values, then choose an appropriate core term (often "code", "identifier", or "indicator") from Attachment 2, add the name of the set to it, and add an appropriate corresponding AIXM "data type" term with the variables assigned accordingly, separating all terms by hyphens.

The table below shows some examples of names for enumerated VD's [Note: these VD's are for illustration purposes only and definitions are not approved].

VD Name	VD Definition
Code-gender-ALPHANUMERIC(1,1)	The set of ISO/IEC 5218 standard codes representing human sexes...
Code-FAA-regions-ALPHA(2,2)	The set of codes representing FAA regions…
Code-weather-phenomenon-precipitation-ALPHA(2,2)	The set of codes used to describe solid or liquid water particles that fall from the atmosphere and reach the ground...
Code-states-ALPHA(2,2)	The set of ANSI X3.38 standard 2-letter codes representing U.S. states and territories...
Code-states-CONUS-ALPHA(2,2)	The set of ANSI X3.38 standard 2-letter codes representing the continental United States...
Identifier-meteorological-station-ALPHANUMERIC(4,5)	The set of designations used to identify or represent meteorological stations…
Identifier-something-else	The set of authorized designators for something else…

Since the FDR lists VD names in alphabetical order, the author should be able to quickly find those of interest and check to see if they meet his needs. If none do, he may need to propose a new one, or possibly he may handle the discrepancy via a comment in the DE. Here is an example: suppose his DE has a domain consisting of only the 2-letter codes for states in New England. In this situation, he may decide that New England states are a distinct, well-known set that deserves a new VD called "code-states-New-England-ALPHA(2,2)". On the other hand, if the DE uses all but a few of the 2-letter state codes, as in "all the states with exception of the Gulf states", he may decide to handle that exception via a comment at the data element level.[13] Finally, if it is not a question of subsets of one code set but rather of a different set altogether, like "01 = Alabama, 02 = Alaska, etc." then he would create another VD named something like "code-states-ALPHANUMERIC(2,2)".

5. Guidance for Naming Non-Enumerated Value Domains

> ***Choose an appropriate core term from Attachment 2, add the unit of measure or other qualifying term if needed, and add an appropriate corresponding AIXM "data type" term with the variables assigned accordingly, separating all terms by hyphens.***

For example:

- A VD whose values are represented by 60 printable characters of any sort could be named "**text-CHARACTER2(1,60)**".
- A VD whose values are represented as angular measures in degrees where degrees vary from 0 to 360 with no significant decimal figures could be named "**degrees-DEGREES1(1,3,0)".**
- A VD whose values are represented as a quantity in pounds where quantities vary from -99.9 to 99.9 could be named "**quantity-pounds-ZNUMBER(1,2,1)**".

As with the enumerated VD case, an author may find that he could reuse the quantity-pounds-ZNUMBER(1,2,1) value domain for his particular data element, except that his DE's values are further constrained by ranges different from the allowed values. He then has a choice: either put the constraint as a note in the data element's "Remarks" attribute or create a new value domain and add another qualifier term to its name to make it unique, e.g. "quantity-pounds-minus50-to-50-ZNUMBER(1,3,0)". It is preferable to write the special constraints in the data element remarks, if possible, to minimize the number of VD's.

The following table cross-references core terms from Attachment 2 with appropriate AIXM predefined data types from Attachment 3. It should be emphasized that the proposed cross-references are only suggestions; for instance, any core term can be associated with the first 5 AIXM "textual" data types. Here is an example: a data concept WeatherSurfaceObservation_AmbientTemperature has a "degrees-Celsius" VD that is represented textually rather than as a number, that is, it is formatted as "(M)(d)dd" where instances like "M25" are interpreted as minus 25 degrees Celsius. In this case the VD can be named **degrees-Celsius-ALPHANUMERIC(2,4)**.

[13] We might develop a metric and rule based on the percentage of codes left out of the subset – if the percentage is less than, say, 20%, handle via comment; if more, create a new VD.

Value Domain Core Terms Cross-Referenced to AIXM Predefined Data Types

Core Terms from Attachment 2	AIXM Predefined Data Type	Short Definition (i.e., not including AIXM rules; see Attachment 3)	AIXM Example, followed by "Instantiated example"
*Text *Identifier *Code *Indicator	ALPHA(n,m)	A string of n to m upper case letters	ALPHA(3,3) "KXY"
*Text *Identifier *Code *Indicator *Number	ALPHANUMERIC(n,m)	A string of n to m upper case letters and/or digits	ALPHANUMERIC(3,5) "3ABC"
*Text *Identifier *Code *Indicator *Number	CHARACTER1(n,m)	A string of n to m upper case letters and/or digits and/or space, plus, minus, solidus (/)	CHARACTER1(3,6) "R 9/A"
*Text *Identifier *Code *Indicator *Number	CHARACTER2(n,m)	A string of n to m Unicode characters	CHARACTER2(1,20) "circleArea = $\pi(r^2)$"
*Text *Identifier *Code *Indicator *Number	CHARACTER3(n,m)	A string of n to m upper case letters and/or digits and/or special characters[14]	CHARACTER3(3,30) "YVO VAL-D'OR, QUE."
*Amount-dollar *Elevation-AGL *Elevation-MSL *Percent *Quantity *Rate *Time-ordinal *Time-period *Temperature *Pressure	NUMBER(n,m,p)	A string of digits representing an unsigned number with n to m significant (integer) figures and 0 to p significant (decimal) figures. If n = m, the integer part is fixed length. Period is optional, but not implied.	NUMBER(1,3,5) "123.12345", "2.4", "007", "011.10"

[14] Special characters are: space| exclamation mark| double quote| number sign| dollar sign| percent| ampersand| quote| left paren| right paren| asterisk| plus sign| comma| minus sign| period| solidus| colon| semicolon| less than operator| equals operator| greater than operator| question mark| commercial at| left bracket| reverse solidus| right bracket| circumflex| underscore| vertical bar| left brace| right brace.

Core Terms from Attachment 2	AIXM Predefined Data Type	Short Definition (i.e., not including AIXM rules; see Attachment 3)	AIXM Example, followed by "Instantiated example"
*Amount-dollar *Elevation-AGL *Elevation-MSL *Quantity *Rate *Time-ordinal *Temperature *Pressure	ZNUMBER(n,m,p)	Like NUMBER, except signed	ZNUMBER(3,3,2) "-034.00", "+025", "000.0"
*Degrees	DEGREES1(n,m,p)	An angular measure expressed as NUMBER, except the integer part is between 0 and 360 [note: EUROCONTROL limits this to 359] and 0 <=p <= 4	DEGREES1(1,3,4) "270.2334"
*Degrees	DEGREES2(n,m,p)	An angular measure expressed as ZNUMBER, except the integer part is between 0 and 180 and 0 <=p <= 4. Plus sign or no sign = East, and minus sign = West.	DEGREES2(1,3,4) "+60.2"
*Date *Year	*DATE(y,m,d)* This is like the XML standard for date.[15] **NOTE: The AIXM data type they call DATE is called EDATE in this table.**	Index values are 1 or 0, indicating presence or absence of YYYY, MM, DD components Components separated by hyphen.	DATE(1,0,0) "1995" DATE(1,1,1) "1984-02-26" DATE(0,1,1) "08-31" Leading/embedded zeroes are included.
*Date *Year	*CDATE(c,y,m,d)* This is a "compact" date, i.e., without hyphen separators. **This is not currently an AIXM datatype.**	Index values are 1 or 0, indicating presence or absence of CC, YY, MM, DD components Leading/embedded zeroes are included	CDATE(1,1,0,0) "1995" CDATE(0,1,1,1) "840226" CDATE(1,1,1,1) "19841231"
*Date *Year	*EDATE (y,d,m)* **This is a draft AIXM datatype per 6/10/03 discussion with Eurocontrol. It is currently called "DATE"; see Attachment 3.**	3 forms used: EDATE(1,0,0) is YYYY; EDATE(1,0,1) is YYYY-MM; EDATE(0,1,1) is DD-MM or "SDLST" or "EDLST", meaning start/end of daylight savings time Components separated by hyphen.	EDATE(1,0,0) "1995" EDATE(1,0,1) "1984-02" EDATE(0,1,1) "31-08", "SDLST" Leading/embedded zeroes are included.

[15] This and other terms designated as not being AIXM data types (except CTIME2) were suggested by Carol Uri, 6/10/2003.

Core Terms from Attachment 2	**AIXM Predefined Data Type**	**Short Definition (i.e., not including AIXM rules; see Attachment 3)**	**AIXM Example, followed by "Instantiated example"**
*Time-local *Time-UTC	TIME(h,m,s)	An absolute time of the day in the forms HH:MM:SS or HH:MM. Index values are 1 or 0, indicating presence or absence of HH, MM, or SS components. Components separated by colon.	TIME(1,1,1) "03:59:02" TIME(1,1,0) "24:00" Leading/embedded zeroes are included.
*Time-local *Time-UTC	*CTIME(h,m,s,p,,z)* This is a "compact" time, i.e., without colon separators, per 6/10/03 discussion with Eurocontrol. Here p is the precision (**expressed as number of decimal places**) of the seconds component and Z is optional, e.g., CTIME(1,1,0,0,0) would mean "hhmm" and CTIME(1,1,1,2,1) would be "hhmmss.ssZ" **This is not currently an AIXM datatype**.	Like TIME, except p is the precision of the seconds component, 0 <= p <= 4, and "Z" meaning Zulu is optionally included in the string.	CTIME(1,1,1,4,1) "035902.1234Z" CTIME(1,1,0,2,1) "1348.33Z" Leading/embedded zeroes are included.

Core Terms from Attachment 2	AIXM Predefined Data Type	Short Definition (i.e., not including AIXM rules; see Attachment 3)	AIXM Example, followed by “Instantiated example”
*Time-local *Time-UTC	*CTIME2(h,m,s,p,,z)* This is a variation on CTIME .* Here s is the precision of the seconds component, and p is the precision of the milliseconds component, **expressed as number of milliseconds** and Z is optional, e.g., CTIME2(1,1,0,0,0) would mean “hhmm” and CTIME2(1,1,1,100,1) would be “hhmmss.pZ” CTIME2(1,1,1,10,0) would be “hhmmss.pp”. CTIME2(1,1,1,1,0) would be “hhmmss.ppp” So we see that h=1 means hours are used, m=1 means minutes are used, s=10 means seconds are used, but with a precision of 10s of seconds, s=1 means seconds are used with precision of one second, p=100 means milliseconds are used, with the precision of 100 milliseconds, p=10 means millisecond precision is 10 milliseconds, p=1 means milliseconds to the precision of 1 millisecond. **This is not currently an AIXM datatype**. * Suggested by Therese Smith, 8/14/2003	Like TIME, except p is the precision of the milliseconds component (in milliseconds), 0 <= p <= 999, and “Z” meaning Zulu is optionally included in the string.	CTIME2(1,1,1,4,1) “035902.123Z” CTIME2(0,1,1,10,1) “1348.33Z” if we wanted precision even finer than 1 millisecond (not that this is likely), we could add microseconds CTIME2(1,1,1,1,250,0) “125959.123250” Leading/embedded zeroes are included.
*Date-time-local *Date-time-UTC	DATETIME(s)	2 forms used: YYYY-MM-DD HH:MM:SS or YYYY-MM-DD HH:MM Index “s” is 1 or 0 indicating presence or absence of seconds	DATETIME(0) “1995-03-21 08:24” DATETIME(1) “1995-03-21 08:24:59”

Core Terms from Attachment 2	AIXM Predefined Data Type	Short Definition (i.e., not including AIXM rules; see Attachment 3)	AIXM Example, followed by "Instantiated example"
*Date-time-local *Date-time-UTC	*CDATETIME(s,p,z)* This is a "compact" time, i.e., without hyphen/colon separators, per 6/10/03 discussion with Eurocontrol. Here p is the precision of the seconds component and Z is optional, e.g., CDATETIME(0,0,1) would mean "yyyymmddhhmmZ" **This is not currently an AIXM datatype**.	Like DATETIME, except p is the precision of the seconds component, 0 <= p <= 4, and "Z" meaning Zulu is optionally included in the string.	CDATETIME(0,0,0) "199503210824" DATETIME(1,3,1) "19950321082459.33Z" Leading/embedded zeroes are included.
*Latitude (like LATITUDE in form 1 or 2)	LATITUDE	A string of digits (and optional period) plus N or S in one of these forms: 1. DDMMSS.ss…X 2. DDMMSSX 3. DDMM.mm…X 4. DDMMX 5. DD.dd…X (fractions of seconds is 1 - 4; fractions of degrees and minutes is 1 - 8)	DDMMSS.ss…X "455959.9988S" DDMMX "0004N", "1259S" DD.dd…X "09.7S", "89.12345678N" Note leading/embedded zeroes are included for degrees, minutes, and seconds less than 10
*Latitude	*LATITUDE-P(d,m,s,p)* This latitude includes a precision indicator, per 6/10/03 discussion with Eurocontrol. Here p is the precision of the least component included in the latitude, e.g., LATITUDE-P(1,1,0,3) would mean "DDMM.mmm[N/S]" **This is not currently an AIXM datatype**	Like LATITUDE, except index values are 1 or 0, indicating presence or absence of DD, MM, SS components, and p represents the precision of the least component. (fractions of seconds is 1 - 4; fractions of degrees and minutes is 1 - 8)	LATITUDE-P(1,1,1,4) "455959.9988S" LATITUDE-P(1,1,0,0) "0004N", "1259S" LATITUDE-P(1,0,0,1) "09.7S" LATITUDE-P(1,0,0,8) "89.12345678N" Note leading/embedded zeroes are included for degrees, minutes, and seconds less than 10
*Longitude (like LONGITUDE in form 1 or 2)	LONGITUDE	Like LATITUDE, except DDD instead of DD, and parameter "Y" represents E or W instead of N or S. Note leading/embedded zeroes are included for degrees, minutes, and seconds less than 10	DDDMMSS.ss…Y "0010101.9967E" DDDMMY "18000W" DDD.dd…Y "013.12345678E"

Core Terms from Attachment 2	AIXM Predefined Data Type	Short Definition (i.e., not including AIXM rules; see Attachment 3)	AIXM Example, followed by "Instantiated example"
*Longitude	*LONGITUDE-P(d,m,s,p)* This longitude includes a precision indicator, per 6/10/03 discussion with Eurocontrol. Here p is the precision of the least component included in the longitude, e.g., LONGITUDE-P(1,1,0,3) is "DDDMM.mmm[E/W]" **This is not currently an AIXM datatype**	Like LATITUDE-P, except DDD instead of DD, and E or W is appended instead of N or S.	LONGITUDE-P(1,1,1,4) "0010101.9967E" LONGITUDE-P(1,1,0,0) "18000W" LONGITUDE-P(1,0,0,8) "013.12345678E" Note leading/embedded zeroes are included for degrees, minutes, and seconds less than 10
*Magnetic-Variation	*DEGREESMV(n,m,p)* This is per 6/10/03 discussion with Eurocontrol. **This is not currently an AIXM datatype**	Like NUMBER, except the integer part is between 0 and 90 and 0 <= p <= 1, and E or W is appended	DEGREESMV(1,2,1) "7.0E"
	BLOB (Binary large object)	A variable length sequence of octets	
	CRCV(n) for Cyclic Redundancy Check Values	A string of n digits and/or A,B,C,D,E,F where n is either 2, 6, or 8 to contain a CRCV in hexadecimal format: CRCV(2) – level of integrity is "low" (8 bit) CRCV(6) – level of integrity is "medium" (24 bit) CRCV(8) – level of integrity is "high" (32 bit)	CRCV(2) "6C" CRCV(6) "D28EB4" CRCV(8) "7AF3CB18"

Attachment 2: Value Domain Core Terms

Recommended value domain core terms are listed below. See the value domain terms recorded in the FDR for the most current list.

amount-dollar: A numeric quantification of a monetary value expressed in monetary units of U.S. dollars and cents in the form "$$$$(.¢¢)" where "$$$$" represents dollars to whatever number of significant digits is required and optional "¢¢" represents the number of cents. For non-monetary numeric values, use the "quantity" value domain term.

code: A string of one or more characters or symbols that is substituted for a specific meaning. A code is often a simpler or shorter term which can be related to the original meaning; e.g. Massachusetts identifies a specific state, and MA is a code for Massachusetts. Other examples are "LAX" (Los Angeles International Airport) and "ORD" (Chicago O'Hare International Airport). See also **identifier**.[16]

The explicit representations for certain codes are as follows:

code-states; States of the United States: If used without modifiers, the value domain term is expressed per ANSI X3.38, *Codes–Identification of States, the District of Columbia, and the Outlying and Associated Areas of the United States.* Note that these codes are interchanged in the two alpha character format option of the standard, regardless of their display/report formats.

code-countries; Countries of the World: If used without modifiers, the value domain term is expressed per ISO/IEC 3166, *Codes for the Representation of Names of Countries*. Note: Country code is always interchanged in the two alpha character format option, regardless of any display/report formats.

---

[16] The distinction between code and identifier is not always clear-cut. For example, LAX identifies a specific three-dimensional point, namely the highest point on a certain runway at LA airport, and in air traffic control usage it represents Los Angeles International Airport, in the sense that LAX implies that airport. However, usage as code vs. identifier depends upon who is using it. If it is used by a passenger to describe a desired airline reservation, then it is being used as a code; but if it is used by an air traffic controller or pilot, then it is being used as an identifier. A flight plan can identify a destination point with the understanding that the tolerance for arriving at that point is much larger than a few centimeters. When a flight plan identifies LAX, most runways at the airport would probably meet the tolerance criterion, but the airport parking lot would not. So one finds oneself lost in the minutiae of making a code-vs.-identifier decision based upon whether a code for the long name of the airport, plus the tacit assumption that it means a runway, is different from an identifier of a specific point with a tolerance around it, such that reachable-by-taxiing-runways are included, whereas other points within the airport are not.

A way of distinguishing a code from an identifier may be to recognize that a processing step for coding, likewise a processing step for decoding, occurs when a code is used, and does not occur when an identifier is used. For example, LAX used as an identifier of a fix can be looked up in FAA Order 7350.7. Its latitude and longitude can also be looked up. LAX is a shorter, simpler representation of that latitude/longitude pair, so it fits the mathematical definition of code. The decoding process is the looking up, and the looking up is the indirection.

In fact, one can directly represent Los Angeles International Airport with its name. In contexts where needed assumptions are true, one can represent it by LAX. One might also represent it by its picture, by the numerical latitude and longitude of some runway intersection, by a description of its airspace boundaries, or by its inter-facility address as seen from its parent Air Route Traffic Control Center (this last will have both coded and decoded forms). There are many means of representation, not all of them codes. *(Comment provided by Therese Smith, Air Traffic Software Architecture, Inc. and paraphrased here)*

code-gender; Human Sex: If used without modifiers, the value domain term is expressed per ISO/IEC 5218, *Representation of the Human Sexes*. Note: only three of the four codes for representation of human sexes should be used: “0” for Unknown, “1” for Male, and “2” for Female.

date: An identification of a particular Gregorian calendar day expressed by its calendar year, month, and ordinal numbered day within the month. If used without modifiers, the value domain term is expressed per ANSI X3.30, *Representation of Date for Information Interchange* in the form YYYYMMDD, where YYYY represents a calendar year in the Gregorian calendar, MM represents a month within such a year, and DD represents a day in such a month. This value domain specification is the same as that specified in ISO/IEC 8601-2000, *Data elements and interchange formats—Information interchange-Representation of dates and times,* Clause 5.2, Dates, Subclause 5.2.1.1, Complete Representation—Basic format.

date-time-local: A local date and time at a particular location.

date-time-UTC: The date and time in accordance with the date and time scale maintained by the Bureau International des Poids et Mesures (International Bureau of Weights and Measures) and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals and is denoted as Universal Coordinated Time (UTC). If used without modifiers, the value domain term is expressed in the form YYYYMMDDhhmmss(.s)Z, where YYYY is year, MM is month, DD is day, hh is hour, mm is minutes, ss is seconds, (.s) represents seconds optionally to whatever number of significant decimal digits is required, and Z is a literal meaning Zulu.

degrees: An angular measure.

elevation-AGL: The height or vertical distance of a level, a point or an object considered as a point, on, above, or below the surface of the earth, measured from the earth’s surface.

elevation-MSL: The vertical distance of a level, a point or object considered as a point, on, above, or below the surface of the earth, measured from the earth’s mean sea level datum.

grid: A finite collection of (usually uniformly spaced) points.

identifier: A string of one or more characters or symbols that directly and uniquely designates a specific object or entity but has no readily definable meaning; e.g., serial number, stock number. An identifier is different from a code in that a code is a substitute for a specific meaning. See **code**.

indicator: A special binary code or “flag,” such as Y/N, on/off, T/F.

image: A graphical or pictorial item, e.g., a map, diagram or other graphic, picture, video, movie, or icon. The explicit value domain for each type of image is specified with the appropriate suffix, e.g., image-JPEG, image-GIF, etc.

latitude: The angular distance of a point from the earth's equator, north or south. If used without modifiers, the value domain term is expressed in the form DDMMSS(.s)[N/S], where DD is degrees, MM is minutes, SS is seconds, (.s) is decimal seconds optionally to whatever number of significant digits is required, and [N/S] is direction North or South, e.g., "753440.3428N."

location: A geographical point on, under, or above the surface of the earth. If used without modifiers, the value domain term is expressed per ISO/IEC 6709, *Standard Representation of Latitude, Longitude, and Altitude for Geographic Points* in the sequence of latitude, longitude, and optional altitude in the form [+/-]DDMMSS(.s)[+/-]DDDMMSS(.s)([+/-]999.9), with no spaces, where items enclosed in parentheses are optional, [+/-] indicates a choice of plus or minus sign, DD or DDD is degrees, MM is minutes, SS is seconds, (.s) is decimal seconds of either latitude or longitude to whatever number of significant digits is required; and [+/-]999.9 is the height above or below sea level in meters and decimal meters to whatever number of significant integer or decimal digits is required.

longitude: The angular distance between a given point and the zero meridian passing through Greenwich, England, east or west. If used without modifiers, the value domain term is expressed in the form DDDMMSS(.s)[E/W], where DDD is degrees, MM is minutes, SS is seconds, (.s) is decimal seconds optionally to whatever number of significant digits is required, and [E/W] is direction East or West, e.g., "1354350.9809W."

magnetic-variation: The angular difference between true north and magnetic north as determined from an epoch year description of the earth's magnetic field at a particular point. If used without modifiers, the value domain term is expressed in degrees, decimal degrees to tenths, and direction East or West of the Zero variation line, in the form DD.d[E/W]; e.g., "4.0W".

number: A non-computational string of one or more digits used to designate an item, e.g., a telephone number, street number, apartment number, or social security number.

percent: A ratio of two quantities expressed in numeric format as a decimal number multiplied by 100.

pressure: A measure of force exerted against an opposing body; i.e., thrust distributed over a surface, expressed in units of force per unit of area.

> **pressure-barometric**: The force exerted per unit of area by the atmosphere as a consequence of gravitational attraction upon the "column" of air lying directly above the point in question, measured with a barometer or barograph, ordinarily expressed in inches of mercury.

quantity: A non-monetary numeric value subject to computational manipulations.

rate: A quantity that represents the ratio of one measurable unit to another measurable unit, e.g., miles per hour, gallons per hour, dollars per day.

sound: An audio sequence with an explicit beginning and end. The explicit value domain for each type of sound is specified by a suffix, e.g., sound-wav.

temperature: A quantity that represents the measure of heat in an object.

text: A string of characters or symbols (formatted or unformatted), generally in the form of words; e.g., the name or description of a street, the contents of a document or message, etc.

time-local: A local clock time at a particular location.

time-ordinal: A quantity of time relative to a specific start or reference time.

time-period: A portion of time between two time-points.

time-UTC: A time of day in accordance with the time scale maintained by the Bureau International des Poids et Mesures (International Bureau of Weights and Measures) and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals and is denoted as Universal Coordinated Time (UTC). If used without modifiers, the value domain term is expressed in the form hhmmss(.s)Z, where hh is hour, mm is minutes, ss is seconds, (.s) represents seconds optionally to whatever number of significant decimal digits is required, and Z is a literal meaning Zulu.

year: A specific year in the Gregorian calendar. If used without modifiers, the value domain term is expressed as four digits in the form YYYY.

Attachment 3: AICM/AIXM Predefined Data Types

Introduction[17]

According to the SQL3 Standard, a data type "is a set of representable values". SQL supports three sorts of data types: *predefined data types, constructed types*, and *user-defined types*. The predefined data types are named by the following key words: CHARACTER, CHARACTER VARYING, CHARACTER LARGE OBJECT, BINARY LARGE OBJECT, BIT, BIT VARYING, NUMERIC, DECIMAL, INTEGER, SMALLINT, FLOAT, REAL, DOUBLE PRECISION, BOOLEAN, DATA, TIME, TIMESTAMP, and INTERVAL. These data types are numerous, very complex, in general not bounded, and some are **implementation dependent**. In addition, a number of conversion rules between such types, and functions/operations on such types are defined.

It was, therefore, decided to establish, for use in AICM/AIXM, specific predefined data types. (The intention to use the terms "format" or "data format" instead of "data type" was subsequently abandoned). However, it is recognised that, for each particular implementation of the AICM/AIXM (such as the EAD), these predefined data types will have to be mapped into the specific data types supported by the actual DBMS of the application.

The Character Repertoires

Simple Latin upper case letter:

A |B |C |D |E |F |G |H |I |J |K |L |M |N |O |P |Q |R |S |T |U |V |W |X |Y |Z

Simple Latin lower case letter:

a |b |c |d |e |f |g |h |i |j |k |l |m |n |o |p |q |r |s |t |u |v |w |x |y |z

Digit:

0 |1 |2 |3 |4 |5 |6 |7 |8 |9

Special Character:

space| tab| newline| exclamation mark| double quote| number sign| dollar sign| percent| ampersand| quote| left paren| right paren| asterisk| plus sign| comma| minus sign| period| solidus| colon| semicolon| less than operator| equals operator| greater than operator| question mark| commercial at| left bracket| reverse solidus| right bracket| circumflex| underscore| vertical bar| left brace| right brace

AICM Special Character:

plus sign| minus sign| solidus

Note:

"AICM Special Character" is a sub-set of "Special Character"

[17] The entire Attachment 3, *AICM/AIXM Predefined Data Types,* was obtained from the EUROCONTROL website as of 5/26/2003, http://www.eurocontrol.int/ais/, ©EUROCONTROL 2003.

Predefined Data Types and Domains

1. General

Each domain defined in the entity-relationship model refers explicitly to a (predefined) data type which it may also further restrict.

This sub-section describes the Predefined Data Types needed by AICM/AIXM. The descriptions are given in English prose and pertinent examples are provided. The definitions of the predefined data types are made up of a name (in underlined upper case letters), a general description, where necessary a rationale, an enumeration of (general) rules; in addition, one or more examples are given to outline the precise use of the data types. Indices after the name of a Predefined Data Type are always positive whole numbers.

2. Alpha and Alphanumeric Data Types

ALPHA(n, m):

Description:

A string of n to m (0 < n <= m) "Simple Latin upper case letters".

Rule:

If n = m then the string is of fixed length, otherwise of variable length.

Examples:

- ALPHA(3, 3): ‘ABC’.
- ALPHA(1, 3): ‘A’, ‘AB’, ‘ABC’.

ALPHANUMERIC(n, m)

Description:

A string of n to m (0 < n <= m) "Simple Latin upper case letters" and/or "digits".

Rule:

If n = m then the string is of fixed length, otherwise of variable length.

Examples:

- ALPHANUMERIC(3, 3): ‘X1Z’, ‘2AB’.
- ALPHANUMERIC(1, 3): ‘A’, ‘5’, ‘A1’, ‘7BC’, ‘GHJ’, ‘954’.

3. String Data Types

CHARACTER1(n, m)

Description:

A string of n to m (0 < n <= m)

"Simple Latin upper case letters" and/or

"digits" and/or

"AICM Special Characters".

Rules:

1. If n = m then the string is of fixed length, otherwise of variable length.
2. Neither the first nor the last item can ever be an "AICM Special Character".
3. An "AICM Special Character" must not be followed by an "AICM Special Character".

Examples:

- CHARACTER1(3, 3): ‘A+B’.
- CHARACTER1(1, 3): ‘A’, ‘AB’, ‘ABC’, ‘X/Z’, ‘R 9’.

CHARACTER2(n, m)

Description:

A string of n to m (0 < n <= m) Unicode characters. Any Unicode character is allowed, excluding the surrogate blocks, FFFE, and FFFF: #x9 | #xA | #xD | [#x20-#xD7FF] | [#xE000-#xFFFD] | [#x10000-#x10FFFF]

Note: Particular implementations of AICM/AIXM might restrict the character set that is allowed by the "Character2" data type. For example, in the current EAD SDO implementation, the character set is restricted to ISO 8859-1.

CHARACTER3(n, m)

Description:

A string of n to m (0 < n <= m)

"Simple Latin upper case letters" and/or

"digits" and/or

"Special Characters".

Rules:

If n = m then the string is of fixed length, otherwise of variable length.

Examples:

- CHARACTER3(3, 3): ‘A+B’.
- CHARACTER3(1, 50): "ORGANISATION DE L'AVIATION CIVILE"

BLOB

Description:

A BLOB ("Binary Large Object") is a variable length sequence of octets. No maximum length can be defined within the framework of the AICM. Although all blocks of the ISO/IEC 10646-1 International Standard could be used as "character repertoire" for this data type, practical reason might warrant the use of only a subset thereof.

4. Number Data Types

NUMBER(n, m, p)

Description:

A string of "digits" (plus, optionally, a period) representing either an unsigned integer number (p = 0) or an unsigned decimal number with a minimum of n and a maximum of m (0 < n <= m) significant (integer) figures and a decimal part with minimum 0 and maximum p (p >= 1) significant figures.

Rules:

1. The (optional) period is not counted by the indices n, m, p.
2. If n = m then the integer part is of fixed length, otherwise of variable length.
3. If p = 0 then there is only an integer part (and no period).

Examples:

- NUMBER(3, 3, 0): ‘123’, ’100’, ‘056’, ‘007’, ‘000’.
- NUMBER(1, 3, 0): ‘123’, ’100’, ‘056’, ‘007’, ‘000’, ‘03’, ‘9’, ‘0’, ‘00’.
- NUMBER(3, 3, 2): ‘123’, ’100.04’, ‘056.56’, ‘007.2’.
- NUMBER(1, 3, 2): ‘123.44’, ’100’, ‘056.03’, ‘007.99’, ‘000.12’, ‘03.17’, ‘9.2’, ‘0.86’, ‘00.00’.

ZNUMBER(n, m, p)

Description:

A string of an optional plus sign or a minus sign and "digits" (plus, optionally, a period) representing either a signed integer number (p = 0) or a signed decimal number with a minimum of n and a maximum of m (0 < n <= m) significant (integer) figures and a decimal part with minimum 0 and maximum p (p >= 1) significant figures.

Rules:

1. Neither the (optional) sign nor the (optional) period is counted by the indices n, m, p.
2. If n = m then the integer part is of fixed length, otherwise of variable length.
3. If p = 0 then there is only an optional sign and an integer part (and no period).

4. If all digits (in both the integer and the decimal part) are ‘0’, the sign must be either ‘+’ or missing.

Examples:

- ZNUMBER(3, 3, 0): ‘+123’, ’-100’, ‘056’, ‘-007’, ‘+000’.
- ZNUMBER(1, 3, 0): ‘-123’, ’+100’, ‘-056’, ‘7’, ‘0’, ‘-3’, ‘9’, ‘0’, ‘0’.
- ZNUMBER(3, 3, 2): ‘123’, ’-100.04’, ‘56.56’, ‘007.2’.
- ZNUMBER(1, 3, 2): ‘-123.44’, ’100’, ‘+056.03’, ‘007.99’, ‘-000.12’, ‘03.17’, ‘-9.2’, ‘-0.86’, ‘00.00’.

5. "Degrees" Data Types

DEGREES1(n, m, p)

Description:

An angular measure in full degrees (and, optionally decimals of degrees) expressed as NUMBER(n, m, p) with 0 <= p <= 4.

Rule:

The integer part must be in the range '0’ ... ‘359’.

Examples:

DEGREES1(1,3,4): ‘123’, ’100’, ‘56’, ‘007’, ‘0’, ‘123.0’, ’100.2345’, ‘56.9’, ‘007.5’, ‘000.0’, ‘123.03’, ’100.20’, ‘056.66’, ‘007.07’, ‘000.01’.

DEGREES2(n, m, p)

Description:

An angular measure in degrees (and, optionally decimals of degrees) expressed as ZNUMBER(n, m, p) with 0 <= p <= 4.

Rules:

1. The integer part must be in the range ‘0’ ... ‘180’.
2. The plus sign or no sign stands for east (E), the minus sign for west (W).
3. If the integer part of a given DEGREES2 is ‘180’ then there must either be no decimal part or such a part must be made up of zeroes only and the sign must be ‘+’ or missing.

Examples:

DEGREES2(1,3,4): ‘-123’, ’+100’, ‘56’, ‘-007’, ‘+00’, ‘123.0’, ’-100.2345’ ‘-56.9’, ‘+7.5’, ‘000.0’, ‘-123.03’, ’100.20’, ‘056.66’, ‘007.07’, ‘-0.01’.

6. "Datetime" Data Types

DATE(y, m, d)

Description:

A date according to the Gregorian Calendar. The following forms are currently used in AICM/AIXM:

- [DATE(1,0,0)] 'YYYY'
- [DATE(1,1,0)] 'YYYY-MM'
- [DATE(0,1,1)] either 'DD-MM' or one of the following special values 'SDLST' / 'EDLST'

Rules:

1. The different components are separated by a minus sign (in its meaning of a hyphen);
2. YYYY takes its values from the set {0001, ..., 9998}, these values stand for the legal years 1 to 9998 AD (the need for years BC was not recognized);
3. MM takes its values from the set {01, ..., 12}, these values stand for the legal months within a year;
4. DD takes its values from the set {01, ..., 31}, these values stand for the legal days within a month (thereby obeying the known rules of the maximum number of days in a given month);

Examples:

- DATE(1, 0, 0): ‘1975’, ’1999’.
- DATE(1, 1, 0): ‘1984-12’, ’2001-11’.
- DATE(0, 1, 1): '28-02', '31-08', 'SDLST' (meaning '*start of daylight saving time/start of summer time*'), 'EDLST' (meaning '*end of daylight saving time/end of summer time*').

TIME(h, m, s)

Description:

An absolute time of the day in the forms HH:MM:SS [TIME(1,1,1)] or HH:MM [TIME(1,1,0)], whereby HH represents the "hour", MM the "minute", and SS the "second" component. The indices take the values 1 or 0, thereby indicating the presence (1) or absence of the aforementioned components (0).

Rules:

1. The different components are separated by a colon.
2. HH takes its values from the set {00, ..., 24}.
3. MM takes its values from the set {00, ..., 59}.
4. SS takes its values from the set {00, ..., 59}.
5. If HH = 24 then both MM and SS (if present) must be 00.

Examples:

- TIME(1, 1, 1): ‘00:00:00’, ’03:59:59’, ‘22:23:00’, ‘24:00:00‘.
- TIME(1, 1, 0): ‘00:00’, ‘00:45’, ‘15:25’ ‘19:00’, ‘24:00’.

DATETIME(s)

Description:

A combination of DATE and TIME in the forms YYYY-MM-DD HH:MM:SS or YYYY-MM-DD HH:MM. The index s takes the values 1 or 0, thereby indicating the presence (1) or absence (0) of the seconds (SS) component.

Rules:

1. The different components of the date part are separated by a minus sign (in its meaning of a hyphen), the components of the time part by a colon and the two parts by a space.
2. YYYY-MM-DD and HH:MM:SS take their values as defined under DATE and TIME, respectively.
3. If the date part is made up as ‘0000-00-00’ then the time part must be ‘00:00:00’ or ‘00:00’, respectively. This stands for an unknown date/time in the past or indicates "with immediate effect".
4. If the date part is made up as ‘9999-99-99’ than the time part must be ‘24:00:00’ or ‘24:00’, respectively. This stands for an unknown date/time in the future or indicates "until further notice".

Examples:

- DATETIME(1): ‘0000-00-00 00:00:00’, ’1998-08-03 15:24:59’, ‘9999-99-99 24:00:00‘.
- DATETIME(0): ‘0000-00-00 00:00’, ’1998-08-03 15:24’, ‘9999-99-99 24:00‘.

7. "Positional" Data Types

LATITUDE

Description:

A string of "digits" (plus, optionally, a period) followed by one of the "Simple Latin upper case letters" N or S, in the forms DDMMSS.ss...X, DDMMSSX, DDMM.mm...X, DDMMX, and DD.dd...X. The X stands for either N (= North) or S (= South), DD represents whole degrees, MM whole minutes, and SS whole seconds. The period indicates that there are decimal fractions present; whether these are fractions of seconds, minutes, or degrees can easily be deduced from the position of the period. The number of digits representing the fractions of seconds is 1<= s... <= 4; the relevant number for fractions of minutes and degrees is 1 <= d.../m... <= 8.

Rules:

1. Leading zeroes shall be inserted for degrees (DD) less than 10, and zeroes shall be embedded in proper positions when minutes or seconds are less than 10.

2. The DD part must be in the range ‘00’ ... ‘90’.
3. The MM and SS parts must be in the range ‘00’ ... ‘59’.
4. If the DD part of a given latitude is ‘90’ then all following parts must be made up of zeroes.
5. For the equator, X may take either ‘N’ or ‘S’.

Examples:

- DDMMSS.ssX: ‘000000.00N’, ‘131415.5S’, ’455959.9988S’, ‘900000.00N’.
- DDMMSSX: ‘000000S’, ’261356N’, ‘900000S’.
- DDMM.mm...X : ‘0000.0000S’, ’1313.12345678S’, ‘1234.9S’, ‘9000.000S’.
- DDMMX: ‘0000N’, ’1313S’, ‘1234N’, ‘9000S’.
- DD.dd...X : ‘00.00000000N’, ’13.12345678S’, ‘34.9N’, ‘90.000S’.

<u>LONGITUDE</u>

Description:

A string of "digits" (plus, optionally, a period) followed by one of the "Simple Latin upper case letters" E or W, in the forms DDDMMSS.ssY, DDDMMSSY, DDDMM.mm...Y, DDDMMY, and DDD.dd...Y . The Y stands for either E (= East) or W (= West), DDD represents whole degrees, MM whole minutes, and SS whole seconds. The period indicates that there are decimal fractions present; whether these are fractions of seconds, minutes, or degrees can easily be deduced from the position of the period. The number of digits representing the fractions of seconds is 1 = s... <= 4; the relevant number for fractions of minutes and degrees is 1 <= d.../m... <= 8.

Rules:

1. Leading zeroes shall be inserted for degrees (DDD) less than 100, and zeroes shall be embedded in proper positions when minutes or seconds are less than 10.
2. The DD part must be in the range ‘000’ ... ‘180’.
3. The MM and SS parts must be in the range ‘00’ ... ‘59’.
4. If the DDD part of a given longitude is ‘180’ then all following parts must be made up of zeroes; Y can be either E or W.
5. If all parts are made up of zeroes, Y can be either E or W.

Examples:

- DDDMMSS.ssY: ‘0000000.00E’, ‘0010101.1E’, ’1455959.9967W’, ‘1800000.00W’.
- DDDMMSSY: ‘0000000W’, ’1261356E’, ‘1800000E’.
- DDDMM.mm...Y : ‘00000.0000W’, ’01313.12345678E’, ‘11234.9E’, ‘18000.000W’.
- DDDMMY: ‘00000E’, ’01313W’, ‘11234E’, ‘18000W’.
- DDD.dd...Y : ‘000.00000000W’, ’113.12345678E’, ‘134.9W’, ‘180.000W’.

8. Data Types for Cyclic Redundancy Check Values (CRCV)

<u>CRCV(n)</u>

Description:

A string of n (n in [2, 6, 8])

A |B |C| D| E| F of "Simple Latin upper case letters" and/or "digits"

To contain a CRCV in hexadecimal format.

Rules:

1. If n = 2 then the CRCV level of integrity is "low" (8 bit).
2. If n = 6 then the CRCV level of integrity is "medium" (24 bit).
3. If n = 8 then the CRCV level of integrity is "high" (32 bit).

Examples:

- CRCV(2): ‘6C’.
- CRCV(6): ‘D28EB4’.
- CRCV(8): ‘7AF3CB18’.

APPENDIX 3. WRITING GOOD DEFINITIONS

> **Definition**: A word or phrase expressing the essential nature of a person or thing or class of persons or things; an answer to the question "what is x?" or "what is an x?"; a statement of the meaning of a word or word group. [Webster's Third New International Dictionary of the English Language Unabridged, 1986]

The purpose of a data element definition is to define a data element with words or phrases that describe, explain, or make definite and clear its meaning. *Precise* and *unambiguous* data element definitions are one of the most critical aspects of ensuring data shareability. When two or more parties exchange data, it is essential that all be in explicit agreement on the meaning of that data.

ISO/IEC CD 11179-4[18] provides a guide for writing good data element definitions. There are mandatory **rules** with which all definitions must comply, and there are **guidelines** that should be followed when writing a definition. Note the difference between rules and guidelines: compliance with the rules can be objectively tested, whereas compliance with the guidelines can only be evaluated subjectively. Many of the rules and guidelines cited below are abstracted from this document.

Although ISO/IEC 11179-4 rules and guidelines pertain to data elements and other administered items like data element concepts and value domains, they can also be applied when writing definitions for data constructs such as entities, relationships, attributes, object types (or classes), objects, segments, composites, code entries, messages, classification scheme items, XML tags, etc.

Rules for Writing Good Definitions

A data element definition *must*:

1. Be stated in the singular.
2. State what the concept is, not only what it is not (i.e., never exclusively in the negative).
3. Be stated as a descriptive phrase or sentence(s).
4. Contain only commonly used abbreviations.
5. Be expressed without embedding definitions of other data elements or underlying concepts.

Descriptions and examples of each rule are provided below. Note that the data elements used in the examples have been named according to the FAA Data Registry naming conventions.

1. State it in the singular.

The concept expressed by the definition must be stated in the singular. (An exception is made if the concept itself is plural.)

Example: “Article_Reference_number”

Good: A reference number that identifies an article.
Poor: A reference number that identifies articles.
Reason: The poor definition uses the plural word "articles," which is ambiguous since it could imply that an "article number" refers to more than one article.

[18] ISO/IEC FDIS 11179-4, Part 4: Rules and guidelines for the formulation of data definitions, 2/12/2004

2. State what the concept is, not only what it is not.
A definition cannot be constructed exclusively by saying what the concept is not.

Example: "Freight_Cost_amount"

Good: Cost incurred by a shipper in moving goods from one place to another.
Poor: Cost not related to packing, documentation, loading, unloading, and insurance.
Reason: The poor definition does not specify what is included in the meaning of the data.

3. Use a descriptive phrase or sentence.
A phrase or sentence is necessary to describe the essential characteristics of the concept. Simply stating the name as a synonym, or restating it with the same words, is not sufficient. If more than one descriptive phrase is needed, use complete grammatically correct sentences.

Example: "Weather_Forecast_text"

Good: An estimation or calculation of future weather conditions.
Poor: A weather prediction.
Reason: The poor definition is just a synonym for the name of the concept.

4. Use only commonly understood abbreviations.
Understanding the meaning of an abbreviation or acronym is usually confined to a certain environment. In other environments, the same abbreviation can cause misinterpretation or confusion. Exceptions may be made for common abbreviations such as "i.e." and "e.g." or if an abbreviation is more readily understood than the full form and has been adopted as a term in its own right, such as RADAR (radio detecting and ranging). When an acronym is first used in a definition, it should be expanded.

Example[19]: "elevation-MSL"

Good: The vertical distance of a point or a level on, above, or below the surface of the earth, measured from the earth's mean sea level (MSL) datum.
Poor: The vertical distance from MSL to a specific point.
Reason: The poor definition is unclear because the acronym MSL is not commonly understood and some users may need to determine what it represents. Without the full word, finding the term in a glossary may be difficult or impossible.

5. Avoid embedded definitions.
The definition of a second concept should not appear in the definition proper of the primary concept. Definitions of terms should be provided in an associated glossary. If the second definition is needed, it may be appended.

Example: "Accident_AircraftDamage_code"

Good: A code that designates the level of damage sustained by the aircraft as a result of the accident.

[19] This is an example of a value domain, i.e., a set of valid values for one or more data elements.

Poor: A code that designates the level of damage sustained by the aircraft as a result of the accident. An aircraft accident is an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and the time all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.
Reason: The poor definition contains a concept definition, which should be included in a glossary.

<u>Guidelines</u> for Writing Good Definitions

Highly recommended guidelines are principles that should be followed when writing a data element definition.

A data element definition *should*:

1. State the essential meaning of the concept.
2. Be precise and unambiguous.
3. Be concise.
4. Be able to stand alone.
5. Be expressed without embedding rationale, functional usage, domain information, or procedural information.
6. Avoid circular reasoning.
7. Use the same terminology and consistent logical structure for related definitions.
8. Be appropriate for the type of metadata item being defined.

Descriptions and examples of each guideline are provided below. Note that the data elements used in the examples have been named according to the FDR naming conventions.

1. State the essential meaning.

Include all primary aspects of the concept, but avoid non-essential characteristics.

Example. “Invoice_Total_amount”

Good: The total sum charged on an invoice.
Poor: The total sum of all chargeable items mentioned on an invoice, taking into account deductions on one hand, such as allowances and discounts, and additions on the other hand, such as charges for insurance, transport, handling, etc.
Reason: The poor definition includes extraneous material.

2. Be precise and unambiguous.

The exact meaning and interpretation should be apparent from the definition. A definition should be clear enough to allow only one possible interpretation.

Example: “Shipment_Receipt_date”

Good: The date on which a shipment is received by the receiving party.
Poor: The date on which a specific shipment is delivered.

Reason: The poor definition does not specify what determines a "delivery." "Delivery" could be understood as either the act of unloading a product at the intended destination or the point at which the intended customer actually obtains the product. It is possible that the intended customer never receives the product that has been unloaded at his site or the customer may receive the product days after it was unloaded at the site.

3. Be concise.

The definition should be brief and comprehensive. Extraneous qualifying phrases such as “terms to be described” or “for the purposes of” are to be avoided.

Example: “Casefile_NASChangeProposal_identifier”

Good: A unique identifier assigned to a case file by the National Airspace System Configuration Control Board.

Poor: The case file NCP identifier is an identifier assigned to a case file by the National Airspace System Configuration Control Board for the purpose of NAS CCB administrative procedures or for use in retrieving case file information from the FAA Data Registry.

Reason: In the poor definition, the name of the data element is repeated unnecessarily, and the phrases after “…Control Board” are extraneous qualifying phrases.

4. Make it stand alone.

The meaning of the concept should be apparent from the definition. Additional explanations or references should not be necessary to understand the meaning of the definition.

Example: “Accident_LocationCity_name”

Good: Name of the city nearest to the accident site.

Poor: See “event site” in FAA Order 8020.11.

Reason: The poor definition does not stand alone, but requires the aid of a second definition (event site) to understand the meaning of the first.

5. Express it without embedding rationale, functional usage, domain information, or procedural information.

Reasons as to why the definition is expressed a certain way should not be included in the definition. Functional usage (e.g., “this data element should not be used for…”) or procedural aspects (e.g., “this element is used in conjunction with element X…”) are more properly handled in the FDR as comments or related data references.

Example: “Accident_MidairCollision_indicator”

Good: A code that indicates whether or not the accident involved a midair collision between two aircraft.

Poor: A code that indicates whether or not the accident involved a midair collision between two aircraft. This element is used to count collisions in the air, not on the ground and not with objects (towers).

Reason: Remarks about functional usage (i.e., “this data element is used to count…”) should be omitted from the definition. If this information is needed, it should be entered as a comment.

6. Avoid circular reasoning.
Two definitions should not be defined in terms of each other. A definition should not use the definition of another concept as its definition.

Example: “Employee_Identification_number” and “Employee” (object class)

Poor: Employee_Identification_number – a number assigned to an employee.
Poor: Employee – a person who has been assigned an employee identification number.
Reason: Each definition refers to the other for its meaning. The meaning is not given in either definition.

7. Use the same terminology and consistent logical structure for related definitions.
Use common terminology and syntax (i.e., consistent logical structure) for similar or associated definitions to facilitate understanding.

Example: “Goods_Dispatch_date” and “Goods_Receipt_date”

Good: Goods_Dispatch_date – The date on which goods were dispatched by a given party.
Goods_Receipt_date – The date on which goods were received by a given party.
Poor: Goods_Dispatch_date – The date on which goods were dispatched by a given party.
Goods_Receipt_date – The date on which the customer received the merchandise.
Reason: Users may wonder whether some difference is implied by the use of synonymous terms and variable syntax.

8. Make it appropriate for the type of metadata item being defined.
Each type of metadata item in the FDR (e.g. data element concept, data element, conceptual domain, value domain) plays a different role, and this should be reflected in the definitions.

Examples:

Data element concept: "Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade.
Note: The data element concept makes no reference to a specific value domain.

Conceptual Domain: "Monetary Amount"
Definition: An amount that may be expressed in a unit of currency.
Note: The definition refers to a "dimensionality" of currency, but not to a specific currency.

Data element 1: "European Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade expressed in Euros.

Data element 2: "U.S. Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade expressed in US dollars.
Note: Data element definitions may refer to explicit value domains, since this may be all that distinguishes two data elements.

Value Domain 1: "Amount in Dollars"
Definition: A numeric quantification of a monetary value expressed in units of U.S. dollars and cents in the form "$$$$.¢¢" where "$...$" represents dollars to whatever number of digits is required and "¢¢" represents the number of cents.

Value Domain 2: "Amount in Euros"
Definition: A numeric quantification of a monetary value expressed in units of euros and cents in the form "€€€€.¢¢" where "€€€€" represents euros to whatever number of significant digits is required and "¢¢" represents the number of cents.

Other Good Practices

1. Begin a data element's definition by stating its representation class.
Since a data element always includes representation, begin the phrase that defines the data element by stating the representation class for the data element and its value domain. The definite article "the" is used because the definition refers to a specific data value. For example,

Name: The name of....
Code: The code that represents....
Text: The text that describes (or defines)....
Number: The number assigned by (Dun & Bradstreet, Chemical Abstracts Service, the state) to identify a (business establishment, chemical substance, legislative district)....
OR
The number that represents....
Quantity: The (sum, dimension, capacity, amount) of.... Note that instead of repeating the term "quantity" in the definition, more specific terms are used to describe the type of quantity for which the data element is applicable. This avoids the wordiness of a phrase like "The quantity that indicates the sum of...."

The definition should not begin with an expression such as "term used to describe" or "term denoting," nor should it take the form "is...," "means...," "one of..."

2. Cite the source of the definition
If the definition has been taken from another document, add a reference to it in square brackets after the definition, e.g., [ISO 690].

APPENDIX 4. OUTLINE FOR WORKING GROUP TERMS OF REFERENCE (ToR)

(Name of Working Group)
Proposed **Terms of Reference**
(Once approved by NIAC, "Proposed" will be removed)
(Date)

Background

Provide a one-paragraph summary of the relevant issue(s) that are the basis for specifying a Working Group.

Scope

Provide a concise statement of the problem and work that will be pursued by the Working Group with appropriate boundaries to the problem. Include approximate time frame for the work of the Working Group.

Working Group Action Plan

Provide, in summary form, the task elements that will be the basis for the Working Group's activities over the term of the Working Group's charter.

Product Schedule

State the intended products, such as case file package, briefings, reports, etc., that will be produced and delivered by the Working Group. Specify the approximate date of delivery for each item.

Working Group Membership

Identify the Organizations that will provide members, and the names of those individuals. Identify the Chairperson(s) for the Working Group.

Note: Terms of Reference will be a NIAC agenda item, and the minutes of the NIAC forum/meeting addressing the creation of a Working Group will explicitly record the conclusions. The approval of the ToR will be considered a formal recommendation of the NIAC, thereby requiring the signatures of the Permanent Members.

SAMPLE:

Aircraft Categorization and Identification Standard Working Group Terms of Reference

July 26, 2001

Background

Currently various aviation organizations provide a system in which an aircraft is identified or grouped with similar aircraft. For example, International Civil Aviation Organization (ICAO) Document 8642/28, *Aircraft Type Designators,* lists aircraft type designators used by air traffic control systems throughout the world. The Federal Aviation Administration (FAA) lists approved aircraft type designators in FAA Order 7110.65, *Air Traffic Control.* National aviation authorities (NAA) register aircraft; however, these aircraft registries do not use the same identification systems. Aircraft accident investigators also identify aircraft involved in aircraft accidents. The aircraft identification system used by an aircraft accident investigation organization is not necessarily the same as the aircraft identification system used by that country's NAA.

A standard format in which an aircraft is identified or grouped with similar aircraft responds to Recommendation 1.8.3 of the White House Commission on Aviation Safety and Security. This recommendation directed the FAA to "work with the aviation community to develop standard databases of safety information that can be shared openly."

A grouping based on the aircraft manufacturer, make, model, series, or category (e.g., fixed wing) assists in the air traffic control, aircraft registration, aircraft certification, accident and incident investigation, safety analysis, and other functions. In addition, standards to uniquely identify an individual aircraft would also assist these functions. Existing aircraft unique identification methods (i.e., aircraft tail number and aircraft serial number) fail the exclusivity test—i.e., duplicate serial numbers and registration numbers appear for more than one aircraft.

Many aviation functions use standardized aircraft groupings and individual aircraft identifiers:

Accident/Incident Investigation	Airworthiness Directives
Air Traffic Control	Climb and Descent Instructions
Aircraft Certification	Flight Planning
Aircraft Maintenance	Personnel Licensing
Aircraft Manufacturing	Runway Selection
Aircraft Registration	Safety Analysis
Aircraft Separation	Safety Inspection
Airport Planning	Search and Rescue

Many types of organizations use standard aircraft groupings and individual aircraft identifiers:

Air carriers	Aviation industry foundations, associations, and similar organizations
Air traffic control providers	Commercial Airline Guide Companies
Aircraft insurers	Government organizations that certify and inspect aircraft
Aircraft vendors	Government organizations that register aircraft
Aviation application developers	Accident investigation boards
Aviation historical societies	Manufacturers of new aircraft
	Conformers that modify existing aircraft

More uniform standard aircraft groupings and individual aircraft identifiers will:

- Overcome difficulties in merging data from diverse information systems (e.g., international and domestic sources or public and private sources).
- Reduce costs to merge and transform aircraft data.
- Enlarge the range and depth of aircraft information available for analysis.
- Reduce duplicate or multiple identifiers for the same aircraft, which increases the integrity of information available.
- Establish more useful and meaningful data that is defined and managed consistently.

Scope

The scope of this effort is to develop data standards (including lists of valid values) for aircraft categories and identifiers that are used in National Airspace System (NAS) operations, aircraft registration and certification, accident and incident investigation, safety analysis, and other functions. At a minimum, the following standards will be developed:

- Aircraft manufacturer
- Aircraft make
- Aircraft master model
- Aircraft model
- Aircraft master series
- Aircraft series
- Aircraft category (such as rotorcraft)
- Aircraft sub-category (such as helicopter or gyroplane)
- Unique aircraft identifier
- Aircraft serial number

Types of aircraft that the Working Group will address include:

- Any aircraft built for civilian use whether that aircraft is still in active service or not.
- Military aircraft that meet one of the following criteria:
    1. Excessed or released by military organizations for civilian use.
    2. Modified by manufacturers or others for civilian use.

3. Stored or display as of part of a museum or historical collection.
4. Involved in an aviation accident or incident that (a) was investigated by a civil organization using ICAO international standards and recommended practices for Aircraft Accident and Incident Investigation (Annex 13) and (b) where the authorities obtained and released the manufacturer, model, and serial number of the aircraft.
5. Registered by a military organization with a civilian authority such as the FAA.

The aircraft identifiers and categories established by this Working Group will be presented to the NAS Configuration Control Board (CCB). The Working Group intends for these standards to become an FAA-wide standard adopted for all new FAA systems.

Action Plan

The Working Group members will:

- Determine if additional organizations and personnel should be contacted as a source of information.
- Review products developed by the International Aircraft Categorization and Identification Standard Sub-Team of the Commercial Aviation Safety Team (CAST)/ICAO Common Taxonomy Team.
- Research and review other efforts to establish an aircraft identifier or categories. Examples of other efforts include products developed or employed by:
    - Safety Performance Analysis System (SPAS)
    - FAA's Civilian Aviation Registry, Aircraft Registration Branch (AFS-750)
    - FAA's Office of System Safety (ASY)
    - Air Traffic Control Organizations (e.g., FAA's Air Traffic Services (ATS) or Eurocontrol)
    - Bureau Veritas
    - Transport Canada
- Determine if any modifications are necessary to the products developed for other standardization efforts.
- Determine the FAA offices that will develop and/or maintain the identifiers and categories.
- Develop additional items necessary for presenting the proposal to the NAS CCB.

Product Schedule

- Register proposed data elements that record standard aircraft groupings and individual aircraft identifiers with associated data models, business rules, and specific valid values in the FAA Data Registry (FDR).
- Any other material required for NAS CCB.
- Register *initial* data elements in the FDR by September 28, 2001.

Membership

NAME	ORGANIZATION
Jana L. Hammer	AFS-750
Richard Y. Jordan	VNTSC
Deborah Kane	Advanced Management Technology Inc.
Chris Metts	ATP-110
Patrick Millspaw	ATP-110
Joseph Mooney	AAI-220
Ava Thompson	AFS-751
Robert Toenniessen	ASY-100

Approval

NAS Information Architecture Committee	Routing Symbol	Signature	Date
Member			
Member			
Member			
Member			
Member			
Member			
Member			
Executive Secretary			
FAA Data Registrar			

APPENDIX 5. PROPOSAL PACKAGE SAMPLE

Case file development is a sequence of activities to compile and package the essential data and information about a set of candidate data elements or concepts. The following are typical components of a case file package:

- Case file/NCP form & Work Sheet (Form 1800-2), mandatory
- Proposed Data Standard, mandatory
- Legacy Data Assessment, if applicable
- Collaboration Report (generated from CDIMS), if applicable
- Data Requirements Documentation, mandatory
- Data model report, highly recommended. Models may be represented in any standard notation, such as Entity-Relationship Diagram (ERD) or Unified Modeling Language (UML).

5.1 Case File/NCP Form 1800-2

The case file/NCP form and associated instructions on how to fill out this form are available on the Internet at the Configuration Management web site.

The case file number can be requested from the NIAC Executive Secretary. An example of a case file/NCP form is shown below.

<table>
<tr><td colspan="3">CASE FILE/NAS CHANGE PROPOSAL (PLEASE TYPE OR PRINT NEATLY)</td><td>Page 1 of 2</td></tr>
<tr><td>1.Case File Number

SD100-NAS-004</td><td colspan="3">2. **FOR CM USE** | Case File Received Date | NCP Issuance Date | NCP Number</td></tr>
<tr><td>3. Scope of Change

☐ Local ☒ National
☐ Test</td><td colspan="3">4. Reason For Change

☐ Safety ☐ Technical Upgrade ☐ Systems Interface
☐ Requirements Change ☐ Design Error ☐ Parts Unavailability
☒ Baseline ☐ Other</td></tr>
<tr><td>5 Priority

☒ Normal
☐ Time-Critical
☐ Urgent</td><td colspan="2">6. Justification of Time Critical/Urgent Priority
N/A</td><td>7. Supplemental Change Form
☐ ECR/ECP ☐ TES ☒ N/A

7a. Supplemental Change No._____

7b. Supplemental Change Initiation Date: _____</td></tr>
<tr><td>8. Case File Originator
C. Uri</td><td>9. Originator's Organization
ASD-103</td><td>10. Telephone Number
202-385-7252</td><td>11. Case File Initiation Date
5/12/2003</td></tr>
</table>

12. Type of Document Affected ☐ CPFS ☐ SPEC ☐ MTBK ☒ STD ☐ TI ☐ DWG ☐ IRD/ICD			13. Baseline Document Number(s) **FAA-STD-060, REV A**
14. CI Subsystem Designator **N/A**	15. FA Type **N/A**		16. CI Component Designator **N/A**
17. Facility Identifier (FACID) **N/A**	18. Facility Code (FACCODE) **N/A**	19. Cost Center Code **N/A**	20. System Software Version **N/A**

21. Title

Baseline and add the attached weather data elements to FAA-STD-060, Rev A, Appendix C

22. Description: (a) identification of problem, (b) proposed change, (c) interface impact, (d) cost estimate (e) funding source (f) benefits/risks,
(g) Schedule (h) Other (e.g. logistics, quality, etc.)

(a) FAA Order 7900.5B, Surface Weather Observing, prescribes aviation surface weather observing procedures and coding practices for both manual and automated observations. These procedures and practices provide a framework for identifying surface meteorological phenomena of importance to aviation and reporting their occurrence. In support of the NAS Information Architecture Committee's continuing activity to develop and configuration manage NAS data exchange standards, members of ASD-100's weather functional analysis team used FAA Order 7900.5B and NAS-SR-1000 (excerpt attached) as a source for specifying the attached data elements associated with surface weather observations.

(b) The associated metadata that has been developed for each data element will be registered in the FAA Data Registry as an approved, configuration managed standard. These standards can then be used to develop future IRDs/ICDs that include requirements for the exchange of surface weather observation data.
ARS-20 is being proposed as data steward for these data elements since this organization is responsible for maintaining FAA Order 7900.5B and for negotiations with the National Weather Service.
Informative attachments include an excerpt of NAS-level requirements for the weather information, as well as a section of a UML model that shows an approach toward developing candidate data elements for standardization.

(c) These data elements are currently being exchanged in the NAS and are already "de facto" FAA-wide standards for collecting manual and automated surface weather observations, and for the generation of routine and special aviation weather reports (METAR and SPECI), therefore no change to existing software is required. Standards will apply to new systems development.
(d).Four person-months to develop the standards.

(e) ASD-100

(f) Data standardization reduces the cost, complexity, and overall resources expended on the development and maintenance of software and computer systems.

(g) N/A

(h) N/A

Blocks 1 through 22 are to be completed by originator and/or the NCP coordinator. If a block is not applicable, write n/a. Attach additional sheets if
necessary. See current revision of NAS-MD-001 for detailed completion instructions.

FAA FORM 1800-2 (5-99) Supersedes Previous Edition NSN:0052-00-801-6005

Case File Number **SD100-NAS-004**	NCP Number	Page 2 of **2**

23. Name and Title of Originator's Immediate Supervisor (Type/Print Clearly) **S. Bradford, ASD-103**	Signature	Date

24. Facility/SMO Review (AT/AF)				
Name	Routing Symbol	Date	Concur	Non-Concur
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
Routing Symbol	Signature			
Date				
Routing Symbol	Signature			
Date				
24a. Comments				

25. Regional Review				
Name	Routing Symbol	Date	Concur	Non-Concur
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
☐ Recommend Approval ☐ Disapprove (Enter into CM/STAT. Forward to Prescreening) (Return to Originator)				
Routing Symbol	Signature			
Date				
Routing Symbol	Signature			
Date				
Routing Symbol	Signature/Configuration Mgr/NCP Coordinator/ Reg Exec Sec			
Date				
25a. Comments (Attach additional sheets if necessary)				

26. PRESCREENING

Prescreening Office NIAC

Prescreening Comments:

(Attach additional sheets if necessary)

Reviewers	Routing Symbol	Date	Concur	Non-Concur
Recommended Must Evaluators ARS-20				

☐ Recommend Approval ☐ Recommend Disapproval
☐ New Requirement

(Return original to originating office through the Regional NCP Coordinator)

Routing Symbol	Signature
Date	

27. **For Internal Configuration Management Use Only**

FAA FORM 1800-2 (5-99) Supersedes Previous Edition NSN:0052-00-801-6005

5.2 Proposed Data Standard

The data standard specifications are mandatory and are the most important piece of the case file package since they contain metadata about the individual data standards proposed by the case file. When data standards are approved, these specifications become part of FAA-STD-060, *Data Standard for the National Airspace System*. Developers are required to comply with the specifications when they build the interfaces between future applications that share the standardized data elements. Each data standard specification consists of a subset of the metadata attributes listed in Appendix 1. The report template and accompanying developer compliance requirements are shown below. NOTE: the actual report is generated from the FAA Data Registry and an electronic copy is available on the FDR Portal. A hard copy of the report is maintained in the Document Control Center, DOCCON, by the NAS Configuration Management Branch (ACM-20).

DATA ELEMENT STANDARD

Data Identifier: | **Version**:

Context: | **Context Definition:**

Preferred Name:

Definition:
[Space is dynamically allocated to accommodate the full text of the definition.]

Data Type: | **Data Type Definition**:

Character Set:

Enumerated Value Domain Permissible Values: | **Value Meanings**:

[Space is dynamically allocated to accommodate the number of permissible values.]

Non-Enumerated Value Domain Description:

[Space is dynamically allocated to accommodate the full text of the value domain description.]

Maximum Length: | **Interchange Format**:

Minimum Length:

Unit of Measure: | **Unit of Measure Definition**:

Unit of Measure Precision:

Low Value: | **High Value**:

Informative Meta-Attributes

Administered Item Type:

Alternate Names (Name, Name Type, Context):

Example:

Related Data Elements (Name, Version, Context, Nature of Relationship):

Steward Organization:

Effective Date: | ***End Date***:

Comments:

Developer Compliance Requirements

Meta-Attribute	**Definition**	**Compliance Requirement**
Data Identifier	A language independent identifier of the data element that, together with its Version, uniquely identifies it in the FAA Data Registry.	Developers shall specify the data identifier, version, preferred name, and context in data requirements specifications.
Version	An identification of the latest or previous update in a series of evolving data specifications within the FAA Data Registry.	Developers shall specify the data identifier, version, preferred name, and context in data requirements specifications.
Context	A designation or description of the application environment or discipline in which a data standard is applied or originates from. Alternatively, the scope in which the subject data element has meaning. A *Context* may be a business domain, an agency, an information subject area, an information system, a database, file, data model, standard document, or any other environment.	Developers shall ensure that the specified context is applicable to their development environment when using the data standard. Developers shall specify data identifier, version, preferred name, and context in data requirements specifications.
Context Definition	A natural language textual statement that expresses the essential nature of the context, and permits its differentiation from all other contexts.	In data requirements specifications, the definition shall be used as is without modifications of any kind.
Preferred Name	A single or multiple word meaningful designation assigned to the data element.	Developers shall specify the data identifier, version, preferred name, and context in data requirements specifications.
Definition	A natural language textual statement that expresses the essential nature of the data element specified in the standard, and permits its differentiation from all other data elements.	When data definitions are included in applications, the definition shall be used as is without modifications of any kind.
Data Type	A set of distinct values, characterized by properties of those values and by operations on those values, for example the category used for the collection of letters, digits, and/or symbols to depict values of a Data Element determined by the operations that may be performed on the Data Element. Examples of data types are bitmap, Boolean, real, integer. See the FAA Data Registry for additional information.	In data requirements specifications developers shall, on the interface, represent the associated concept with the data type; i.e., use the data type specified in the data standard.
Data Type Definition	A statement that expresses the essential nature of a data type associated with a data element's value domain, and permits its differentiation from all other data types.	In data requirements specifications developers using any of the data types maintained in the FAA Data Registry shall conform to the form of the data type specified in the data type's corresponding definition.

Meta-Attribute	Definition	Compliance Requirement
Character Set	A collection of graphic symbols (e.g., letters or glyphs) used in writing or printing, in which each character in the collection is assigned a numeric index in a particular coding table. Examples of character sets include US (7-bit) ASCII, EBCDIC, Unicode.	In data requirements specifications developers shall comply with the character set specified for data element interchanges between systems.
Permissible Values	The set of representations of allowable instances of an enumerated value domain of a data element, represented according to the interchange format, data type, and maximum length constraints. The set of representations of permissible instances is associated with one set of **value meanings**. The set can be specified by name (e.g., Postal U.S. State Codes), reference to a source, enumeration of the instances' representations (e.g., AL, AK, etc.), or rules for generating the instances.	In data requirements specifications developers shall use the permissible value and value meaning pairs exactly as is, without changes of any kind, whether they are explicitly identified or identified by reference to the source. When transmitting the data, an application may use a subset of the permissible values, but when receiving the data, an application must be able to correctly accept any and all of the permissible values.
Value Meaning	A statement that expresses the essential nature of a set of permissible values without a specific representation, and permits its differentiation from all other sets. The set can be specified by name (e.g., the states of the United States), or enumeration of the meanings of each permissible value (e.g., the state of Alabama, the state of Alaska, etc.).	In data requirements specifications developers shall use the permissible value and value meaning pairs exactly as is, without changes of any kind.
Non-Enumerated Value Domain Description	A description of a value domain that contains a wide range of data values that cannot be listed, i.e., is not an enumerated value domain. The ranges can usually be described by a set of rules. Example (for "text" value domain): "A string of alphanumeric characters (formatted or unformatted)."	In data requirements specifications developers shall conform to the specified form of the value domain description for non-enumerated value domains.
Maximum Length	The maximum number of storage units (of the corresponding data type) needed to represent a data element. The storage units are considered to be ASCII characters unless otherwise specified.	In data requirements specifications developers shall constrain the length of the data element to be no greater than the maximum length specified.
Minimum Length	The minimum number of storage units (of the corresponding data type) needed to represent a data element. The storage units are considered to be ASCII characters unless otherwise specified.	In data requirements specifications developers shall constrain the length of the data element to be no less than the minimum length specified.
Interchange Format	A single or multiple word designation assigned to a form of interchange for a data element, that permits its differentiation from all other interchange formats, e.g., YYYYMMDD for	In data requirements specifications developers shall comply with the form of interchange specified for data element interchanges between systems.

Meta-Attribute	Definition	Compliance Requirement
	calendar date, where YYYY represents a year, MM represents an ordinal numbered month in a year, and DD represents an ordinal numbered day of a month. See the FAA Data Registry for interchange format notation.	
Unit of Measure	A single or multiple word designation assigned to a measurement framework for data elements with representational forms of quantity, e.g., watt, mile, miles-per-hour, ton, ampere.	In data requirements specifications developers shall not use units of measure other than the one specified for a particular data element. Note: this meta-attribute applies only to quantity-oriented data elements.
Unit of Measure Definition	A statement that expresses the essential nature of a measurement system associated with a data element, and permits its differentiation from all other units of measure.	In data requirements specifications developers shall conform to the form of measurement unit specified in its unit of measure description. Note: this meta-attribute applies only to quantity-oriented data elements.
Unit of Measure Precision	The degree of specificity for a Unit of Measure, expressed as the number of decimal* places to be used in the data element's values. *Precision may be reported in non-decimal units, e.g., in eighths, sixty-fourths, etc. Decimal is assumed unless otherwise specified.	In data requirements specifications developers shall constrain the precision of the data element to the degree specified for the given context.
Low Value	The lowest value in the range of permissible values for a data element with representational form of quantity.	In data requirements specifications developers shall constrain data element permissible values to be no lower than the low value specified.
High Value	The highest value in the range of permissible values for a data element with representational form of quantity.	In data requirements specifications developers shall constrain data element permissible values to be no higher than the high value specified.

Meta-Attribute	Definition	Compliance Requirement
INFORMATIVE	**The following meta-attributes provide additional information to developers.**	
Administered Item Type	The type of data component as managed in the FAA Data Registry, e.g., data element, value domain, object class.	N/A
Alternate Name(s)	The synonymous name(s) by which a data element is known in this or other application environments or contexts.	N/A
Alternate Name Type	The type of name as designated in the FAA Data Registry, e.g., familiar name, XML tag, etc.	N/A
Alternate Name Context	The context in which the alternate name is used or has meaning.	N/A
Related Data Element(s)	A data element that has a special relationship or association with the subject data element.	N/A
Relationship	The nature of the association between the subject data element and the related data element, e.g., part of, similar to, etc.	N/A
Example	A representative sample of an instance of the data element.	N/A
Effective Begin Date	The date that a data standard is approved for use.	N/A
Effective End Date	The date that a data standard is no longer approved for use.	N/A
Steward Organization	The organization that has responsibility for the quality of meta-attribute contents for a data element.	N/A
Comments	Additional explanatory information.	N/A

5.3 Legacy Data Assessment

This section details the proposed data standard's relationship with or potential impacts on those other similar data elements in use in associated systems. The owners of these systems are stakeholders in the data standardization process.

The case file initiator (Working Group or individual) is expected to conduct as part of the research effort a broad search across a majority of the FAA systems to determine what equivalent data elements are in use by the various systems. This search may extend to international registries.

The following table is a sample that can be used to demonstrate the type of information needed. The left column shows the proposed standard data element by its preferred name.

Example Related Data Report

Proposed Standard	Legacy Information	
Data Element Name	**Legacy Data Element Name**	**Associated Systems**
Airport_Location_identifier-ICAO	Airport-ID	System A Interface Requirements Document (IRD)
	AIRPORT	System A
	Airport_Identification	System B IRD
	Apt_ID	System C
	APT_ID	System D IRD
	APT_IDENT	System E
	Facility_ID	System F IRD
	FAC_ID	System F
	Facility_Identification	System G
	AERODROME	System H

The legacy information is shown in the table as the old data element name and associated system. As the MDR becomes populated with baseline metadata about these systems, it will become feasible to extract this from the MDR.

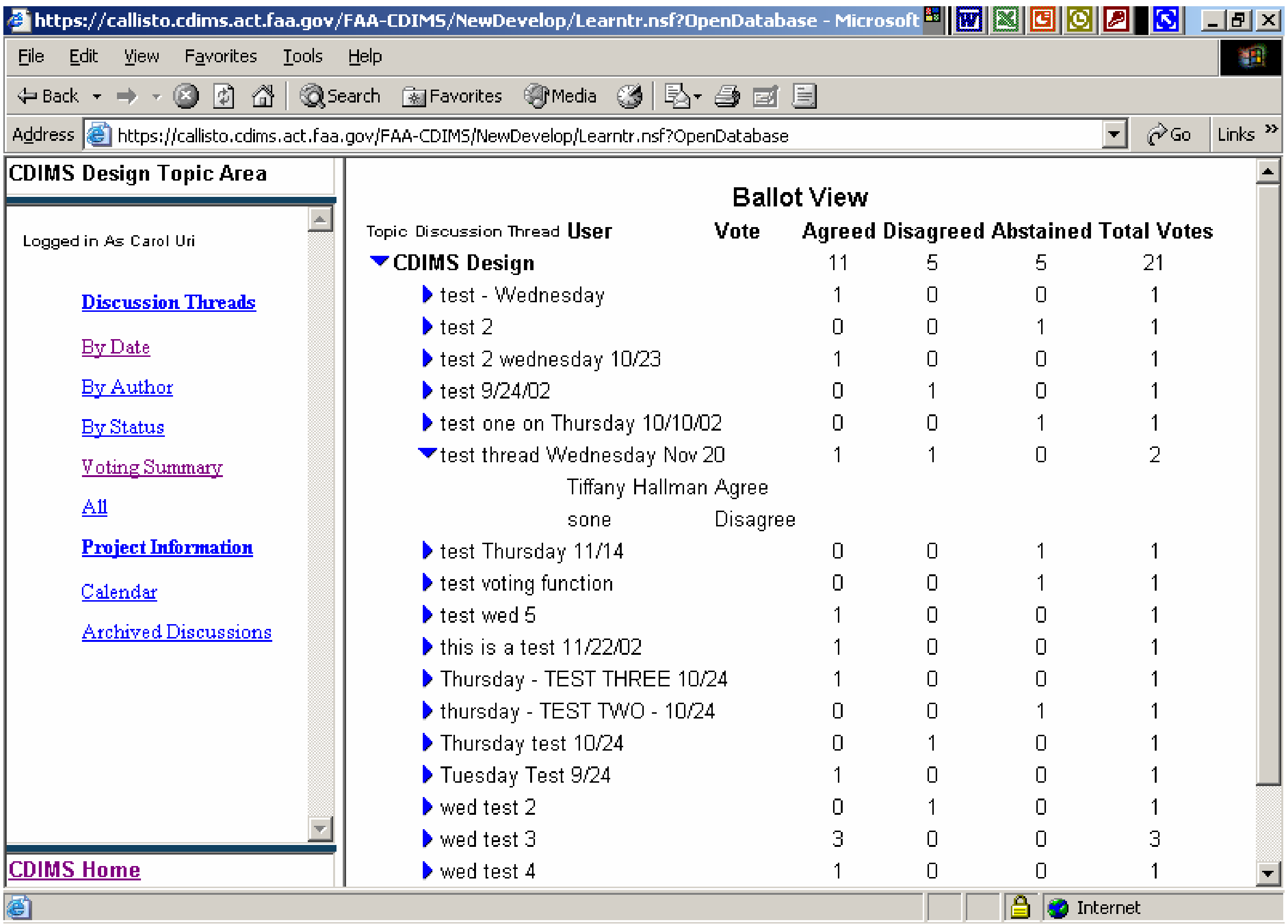
5.4 CDIMS Report

Working Groups are encouraged to utilize NIAC's collaborative discussion tool, CDIMS, to support their collaboration activities. CDIMS is capable of documenting issues raised during the development of the data element standards and of producing a summary report that can be added to the case file package. The objective of this report is to categorize the issues raised in the standards consensus debate, reveal the participants' voting and method of closure of the issue, and show the Line of Business participation in the process.

CDIMS users play several roles, the most important being *moderator* and *collaborator*. A moderator synopsizes and presents issues to be decided, while collaborators discuss the issues and vote on them.

For data standardization issues, the moderator is typically the Working Group Chair or his/her designee, and the collaborators are the Working Group members and other interested parties invited by the moderator to take part in discussions. Collaborators also represent the interest of their Line of Business, particularly when they cast their votes.

Attached is a CDIMS web page showing a "CDIMS Design" collaboration group's issues and voting results. A collaborator submits the issue to the moderator, who opens it up to the rest of the group as a relevant topic, or discussion thread, for discussion and comment. Following a period of discussion, the moderator calls for a vote. The moderator may close the discussion or promote it to other levels, e.g., to the NIAC Permanent Members or Registrar, for further action and/or approval. Individual comments (with or without attached documents for review) are viewable in the expanded discussion threads.



Topic Discussion Thread	User	Vote	Agreed	Disagreed	Abstained	Total Votes
CDIMS Design			11	5	5	21
test - Wednesday			1	0	0	1
test 2			0	0	1	1
test 2 wednesday 10/23			1	0	0	1
test 9/24/02			0	1	0	1
test one on Thursday 10/10/02			0	0	1	1
test thread Wednesday Nov 20			1	1	0	2
	Tiffany Hallman	Agree				
	sone	Disagree				
test Thursday 11/14			0	0	1	1
test voting function			0	0	1	1
test wed 5			1	0	0	1
this is a test 11/22/02			1	0	0	1
Thursday - TEST THREE 10/24			1	0	0	1
thursday - TEST TWO - 10/24			0	0	1	1
Thursday test 10/24			0	1	0	1
Tuesday Test 9/24			1	0	0	1
wed test 2			0	1	0	1
wed test 3			3	0	0	3
wed test 4			1	0	0	1

Sample CDIMS Voting Summary for the "CDIMS Design" Discussion Group

5.5 Data Requirements Documentation

Documentation of the requirement for establishing one or more data standards is a detailed activity that can be performed by searching the NAS Architecture, Capital Investment Plan, NAS-SR-1000, FAA Orders, Federal Aviation Regulations, FAA Standards, and other forms of user needs documentation that aid in creating the requirements picture. The following are illustrations of requirements documentation.

Example 1:

Data Elements in NCP 23039, first NIAC Case File	Data Element Requirements References
DE03 Airport_Location_identifier-ICAO Unique location identifier that is formulated in accordance with rules prescribed by ICAO and assigned to the location of an aeronautical fixed station.	14 CFR Part 91 The point of departure. 14 CFR Part 91 (6) The point of first intended landing and the estimated elapsed time until over that point. 14 CFR Part 91 (2) An alternate airport, except as provided in paragraph (b) of this section. 14 CFR Part 91 (3) Pertinent aeronautical charts. Charts are any or all of: Sectional Aeronautical Charts, Terminal Area Charts, Regional Airport/Facility Directory, IFR Low-altitude En Route Charts, Instrument Approach Charts. FAA Order 7110.65 6. Point of departure. FAA Order 7110.65 8. Destination airport and clearance limit if other than destination airport.

Example 2: Requirements in Case File for NCP 24950, Weather Data Elements

3.1.1.A. The NAS shall acquire and maintain weather information covering the area of NAS responsibility for both domestic and foreign operations. Weather information shall include current, trend, and forecast weather and shall include surface and atmospheric weather at all altitudes affecting flight planning, efficiency, and safety.
3.1.1.A.2. The NAS shall acquire and maintain current surface aviation weather observations.
3.1.1.A.2.a. The content of surface observations shall include at least the following elements:

(1) Cloud layer height and amount
(2) Visibility
(3) Precipitation occurrence, type and amount
(4) Temperature
(5) Dew point
(6) Wind speed, direction, and peak gusts
(7) Altimeter setting and density altitude
(8) Obstruction to visibility
(9) Lightning or thunderstorms
(10) Runway visual range
(11) Snow depth and runway surface condition

5.6 Logical Data Model

Data modeling is an important part of gaining an understanding of the nature of the proposed data elements and how they interrelate. A logical data model may also become a starting point for creating a physical model to analyze systems engineering issues that are not presently a standardization concern but represent evolutionary change in information flows. Models may be represented in any standard notation, such as Entity-Relationship Diagram (ERD) or Unified Modeling Language (UML). See the FAA Data Modeling Process V1.1 document for more information.

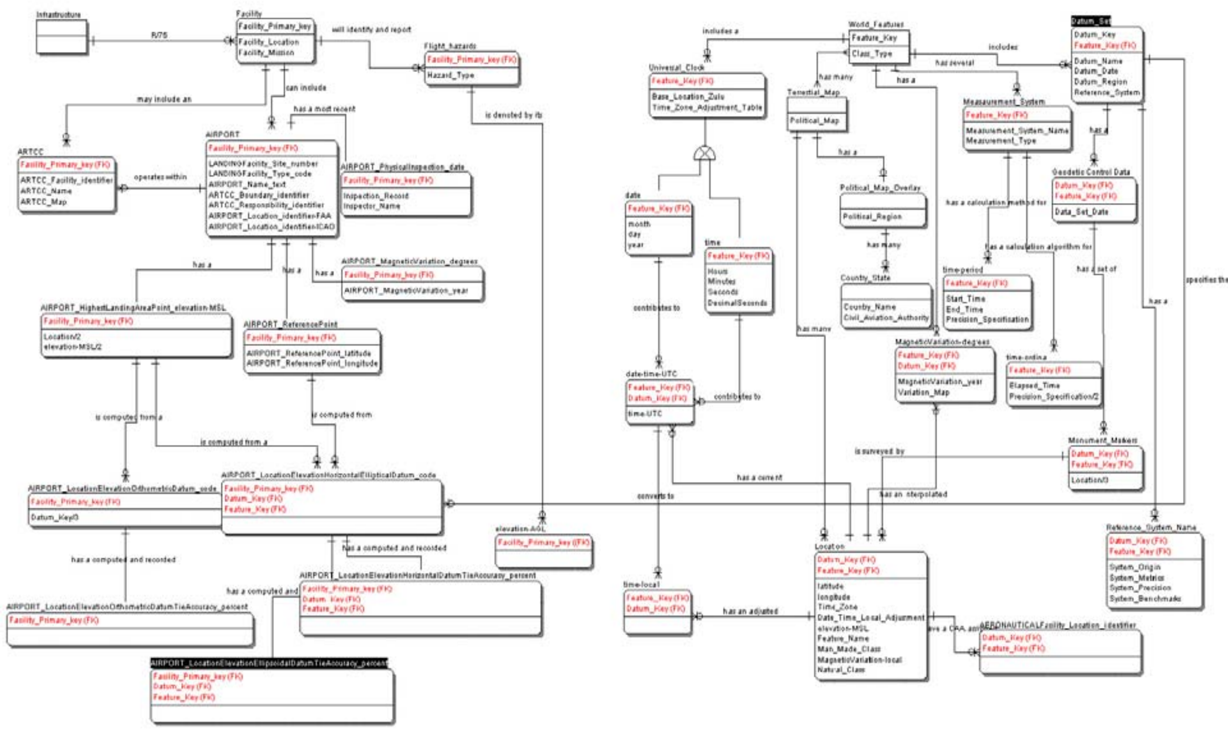


Figure A5-1: Example Logical Data Model

APPENDIX 6. ESTABLISHING A DATA REGISTRY CONTEXT

This Appendix is to be written.

APPENDIX 7. LESSONS LEARNED: PRACTICAL EXPERIENCES

This Appendix contains advice, suggestions, and helpful hints contributed by individuals or groups who have gained experience from data standardization exercises. Anyone who would like to offer materials for inclusion in this Appendix should contact the NAS Information Architecture Committee.

Additional Guidance for Creating Value Domains

Contributed by Therese Smith, Air Traffic Software Architecture, Inc. August, 2003

As we create data exchange standards for the FAA, we will be making some choices about value domains; e.g., whether we should reuse an existing value domain or create a new one. In order to make these choices in an informed fashion, it may help to consider some of the consequences of our choices. One readily available consequence is how long the list of values will be. There are other consequences, some of which come from the subject matter.

In order to develop a sense of what the consequences might be, some questions that viewers of a value domain in FDR might ask have been proposed below. As we choose what value domains we can articulate, we choose the utility of the value domains in providing answers to questions like these. If we can provide useful answers to significant questions, then we are providing a valuable service.

- How many bits does it take to send that representation?
- Could we save on the telephone bill (i.e., reduce bandwidth consumption) by changing that representation?
- Could we save on transmission time (delay as well as bandwidth) by changing that representation?
- Is the data in this representation “spatial” and could it be processed by a GIS (geodetic information system) package?
- Is the data in this representation “temporal” and could it be processed by some software concerned with timing (Microsoft project, e.g.)?
- Is this a “classified” representation (i.e., something in code that a properly prepared recipient would know to decode)?
- Does this representation permit expansion of the elements currently using it (e.g., if we only have 4096 beacon codes today, but we are going to have more tomorrow, have we outgrown the power of the representation)?
- Can this representation be substituted for some other given value domain?
- Can I display/see something represented in this value domain on a web page?
- How hard do I have to work to put something in that representation into an XML document?
- Can data in this representation be sent to a PDA (personal digital assistant)?
- Can data in this representation be compared with data in some other representation (e.g., NUMBER (2,3,0) with NUMBER(3,3,0))?
- Can I convert something in that representation into Spanish/French/Russian?
- Is the representation EBCDIC or ASCII?

Creating ISO 11179 Metadata for En Route Data

Contributed by Therese Smith, Air Traffic Software Architecture, Inc. and Robert Stanley, Informon Corp., August, 2003 [edited by Carol Uri, FAA February 2004]

These notes are organized by the authors' experiences with the FAA Data Registry as it evolves, and with creating metadata for and registering en route data. These events took place over a two- month period in the summer of 2003.

1. We started with a description of what became the common message set, and a version of NAS-MD-311 that was not the most recent, plus the thought that data elements ought to be closely related to fields from NAS-MD-311 Appendix E.
2. We created value domains for the fields in NAS-MD-311 used in interfacility messages, predecessors to the common message set.
3. Looking at the 11179 standard, we observed that there are some ideas about data, and the associated representations, that are close to but not equal to the ideas of fields in NAS-MD-311. En route messaging is performed in a situation that has additional complicating goals, such as conserving bandwidth, beyond the 11179 essential goal, which is conveying information.
4. After developing a grasp of the ideas about data concepts, value domains, and data elements, we applied this structure to analysis of the fields used in en route interfacility messages.
5. We prepared a spreadsheet of en route terms (which are the common message set fields analyzed to make them tractable by 11179 ideas) used as goal data elements.
6. We prepared a spreadsheet of data element concepts one-for-one with data elements.
7. To be entered into FDR, Data element concepts need to have associated conceptual domains, so we created conceptual domains to support the desired data elements, initially one-for-one with the data element concepts. It is a judgement call about how refined a conceptual domain should be, since more refinement of concepts makes for more numerous conceptual domains. This choice brings up the subject of what relative value is produced by one choice over another. Thus several candidate benefits to FAA were suggested. These were cast as questions that a user might ask of FDR. Information related to recurring costs, such as bandwidth utilization, seemed to us one possibly relevant consideration. We raised questions of the nature "what benefit can be provided to whom by the information that would be collected" under one refinement scheme vs. another, and proposed candidates on that basis.
8. We made an initial choice for degree of refinement of conceptual domains, which is much less refined than one-for-one with the data element concepts.
9. We entered the data element concepts and associated them with the conceptual domains.
10. There exists a naming convention for data element concepts which we did not initially observe. In order to comply with the naming convention, we had to execute several steps. First, it seemed desirable to maintain some connection between the item being renamed with its origin in the NAS-MD-311 field set. Furthermore, it seemed (and continues to seem) desirable to be able to conduct a search with the field number, and find the related items in FDR. The attributes usable in searches are finite in number, and it was easy to choose the definition as the attribute in which to store the NAS-MD-311 field number. Additional information is provided so that the analysis of the NAS-MD-311 fields can be a starting point in a search. The traditional names being thus taken care of, our attention turned to the new, conventional names. These are constructed of an

Object Class part, optional qualifiers thereof, a Property part, optional qualifiers thereof, plus syntactical elements. The FAA Data Architecture furnished an excellent source of potential object class and property names, and we used these in so far as it was possible. Occasionally we invented new object class and property names. In some cases, we added new property names to one or another existing object class. This process created the new names on the spreadsheet, and the FDR data was edited accordingly.

11. We created a spreadsheet of value domains associated with the en route terms (the result of the analysis of the fields used in the predecessor to the common message set).
12. Value domains also have a naming convention. This convention utilizes core terms and units of measure among other things. We needed suitable core terms and units of measure. NAS-MD-310 contains a glossary which proved a very useful source for core terms. The glossary entries were arranged, not in alphabetical order, but in a hierarchical fashion on a spreadsheet, such that the more general term (e.g. **fix**) was in a column toward the left and more specific terms, types of the more general terms (in this example, **coordination fix** and **vertex**) were placed indented to the right. The more layers of qualification, the more to the right a term appeared. Those terms with many levels to the right of them were seen to be more basic, foundation ideas, upon which more elaborated concepts were developed, and so were recommended as core terms. A study of units of measure was undertaken from publicly available sources. Beyond this, there is among the NAS-MD's a document containing a table of units of measure used. The units from publicly available sources were augmented with those from the NAS-MD source.
13. Once all of the ingredients required to complete value domain naming were available, we created conventional value domain names. The names hearkening to the NAS-MD-311 field source were, as with data element concepts, relegated to the definition attribute.
14. Once the value domains were available, we could create data elements, which are linkages between data element concepts and value domains.
15. Given a set of data in FDR that people could peruse, it seemed timely to extract from the latest version of the NAS-MDs those fields used in interfacility messages. We decided to include datalink and to include central flow ("Z") messages as well. We examined NAS-MD-311 and NAS-MD-315 to extract any interfacility messages and fields used in them.
16. We then undertook a new analysis of the fields into material tractable for 11179 treatment. A small amount of apparent discrepancy between NAS-MD-311 and NAS-MD-315 was noted and resolved in favor of NAS-MD-311. One result of this review of NAS-MD-311 and NAS-MD-315 was that some fields previously used (120, 121 for example) do not appear in the newer version. Also, there are some changes, and, considering datalink and the central flow messages, lots of additional material.

At this point in the flow of development of FDR entries, resource and time constraints caused us to leave off from pursuing the analysis of the more recent NAS-MD data, and to provide definitions for the already entered administered items, examples for the data elements already entered, and permissible values, value meanings, and value meaning descriptions for the already entered enumerated types, which are mentioned in the value domains. It was also deemed desirable to enter at least those object classes and properties that were used in the naming of the data element concepts.

Findings

As a result of what has been done so far, a trick-of-the-trade might be that it is very important to start with a clear understanding of the 111179 principles. These 11179 concepts are used in the NAS-MD fields, but various considerations, including bandwidth conservation, have altered the implementation so that it is not a pure 11179 style.

For example, one might easily imagine that essentially Boolean variables are represented with a set of two items, such as 1 and 0, or True and False, but there are ways to represent this in less bandwidth, if surrounding circumstances are known, and the implementers of en route messages have exploited such opportunities. It is a trick-of-the-trade to recognize these techniques, and for example, know to decompose such compounds. A simple example is coding the a missing beacon code state by setting a beacon code conveyed in characters which are FFFF for missing beacon code but octal digit characters convey a beacon code when it is available. Thus two 11179 data elements exist in this one construct.

Another example of a (laudable) technique used in the en route messages is the conveyance of the north mark in CENRAP data. This embedding of a literal in a certain point in a message stream of target reports is a natural for representing the essential information, but the style is somewhat foreign to the notions of 11179 where there is a concept conveyed by a representation with characteristics such as character set, rather than more ephemeral characteristics such as timing. Much use is made of contextual information, for instance the allowed formats for a field can depend upon the message in which the field finds itself.

In 11179, a data element has a value domain (with a format attached). Thus one can imagine a different data element for every allowed format, which could imply a data element for each field times the number of messages-implying-format-constraints in which that field can be used. It is thus a trick-of-the-trade to choose the value domain to accommodate the multiple cases when the increased information obtained by separating into more data elements does not provide value. An example of multiple permissible formats, though not necessarily context dependent, is the **fix representation**. Fixes can be represented by a name, or a latitude/longitude, or in some messages an abbreviated latitude/longitude, or a fix-radial-distance. Value domains could either be chosen as generally inclusive, such as “two to twelve alphanumeric characters” covering all of the above cases, or value domains can be prepared for each of the cases listed above. The postulated question, “How much bandwidth does it save us to use abbreviated latitude/longitude representations in such-and-such circumstances?” can be addressed if the detailed value domains are prepared, but it cannot be answered if the more inclusive value domain is always used.

REFERENCES

Name	Web Link
Capability Architecture Tool Suite – Internet (CATS-I)	http://www.nas-architecture.faa.gov/cats/
Capital Investment Plan (CIP)	http://nasdocs.faa.gov/
Collaborative Discussion and Information Management System (CDIMS)	http://callisto.cdims.act.faa.gov/
Document Control Center	http://www.faa.gov/cm
DOD 8320.1-M-1, Data Standardization Procedures, April 1998. NOTE: this document is now obsolete. Contact DISA.	http://diides.ncr.disa.mil/mdregHomePage/mdregHome.portal
EUROCONTROL Aeronautical Information Services, AIXM Data Types and AIXM Primer, May 2003	http://www.eurocontrol.int/ais/aixm/index.htm
FAA Acquisition Management System (AMS)	http://fast.faa.gov/
FAA Acquisition System Toolset (FAST)	http://fast.faa.gov/
FAA Data Architecture V2	http://intranet.faa.gov/aio/e-government/enterprise_architecture/index.htm
FAA Data Modeling Process V1.1	http://intranet.faa.gov/aio/e-government/enterprise_architecture/index.htm
FAA Data Registry (FDR)	http://fdr.faa.gov/
FAA Data Registry's User Guide and Reference v1.0, Oracle Corporation	http://fdr.faa.gov/ (integrated in FDR user help)
FAA Enterprise Architecture	http://intranet.faa.gov/aio/e-government/enterprise_architecture/index.htm
FAA Metadata Repository (MDR)	http://mdr.faa.gov/

Name	**Web Link**
FAA Order 1375.1C, *Data Management Policy*	http://intranet.faa.gov/aio/documents/business_value.htm
FAA-STD-025, *Preparation of Interface Documentation*	http://nasdocs.faa.gov/
FAA-STD-060, *Data Standard for the National Airspace System*	http://nasdocs.faa.gov/
ISO/IEC 11179 standard (ISO = International Organization for Standardization, IEC = International Electrotechnical Commission) *Information Technology – Metadata Registries, Parts 1 – 6*	Copies of ISO standards can be obtained electronically from the Web site http://www.iso.ch/iso/en/prods-services/ISOstore/store.html. Paper standards are available through Global Engineering Documents, 15 Inverness Way East, Sales – C303B Englewood, CO 80112-9649, Telephone: (800) 854-717, FAX (303) 397-2740 or at the Web site http://global.ihs.com/. Copies are also available on the FAA Data Registry portal at http://fdr.faa.gov.
National Airspace System (NAS) Architecture	http://www.faa.gov/nasarchitecture/
NAS Configuration Control Board (NAS CCB) Charters	http://www.faa.gov/cm/charters.htm
NAS Configuration Control Board (NAS CCB) Operating Procedures	http://www.faa.gov/cm/charters.htm
NAS Data Classification Scheme V1.0	TBD
NAS-DD-1000 – NAS Level I Design Document	http://nasdocs.faa.gov/
NAS-SR-1000 – NAS Level Requirements (see “Requirements” view of NAS Architecture)	http://www.nas-architecture.faa.gov/cats/
NAS-SS-1000 – NAS System Specification	http://nasdocs.faa.gov/
NAS Information Architecture Committee (NIAC)	http://www.tc.faa.gov/act-500/nseb/niac/

Name	Web Link
NAS Information Architecture Committee (NIAC) Charter	http://www.tc.faa.gov/act-500/nseb/niac/
NAS Information Architecture Committee (NIAC) Operating Procedures	http://www.tc.faa.gov/act-500/nseb/niac/
Office of Information Services/CIO (AIO)	http://www.faa.gov/aio/

DEFINITIONS

Attribute	A property or characteristic that is common to all instances of an entity. [DoD 8320.1-M-1]
Business Rule	A statement of fact that identifies constraints governing the business functions and information requirements of an enterprise. [DoD 8320.1-M-1]
Data	Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human or automated means. [FAA-STD-060 Rev. B]
Data Architecture	Data architecture depicts the objects that are relevant to an enterprise and their relationship to each other. It describes the structure of the data objects and elements, their relationships, and the principles and guidelines governing their design and evolution over time. It defines a process for rationalizing data needs across applications and determining its appropriate distribution and placement [FAA Data Architecture V2]
Database	A collection of data items that have constraints, relationships, and schema. A collection of interrelated files stored together, where specific data items can be retrieved by various applications. A collection of data arranged in groups for access and storage. [FAA Data Architecture V2]
Data Element	A basic unit of identifiable and definable information that occupies the space provided by fields in a record or blocks on a form. A data element has an identifying name and value or values for expressing specific facts. [FAA-STD-060 Rev. B]
Data Model	A representation of the things of significance to an enterprise and the relationships among those things. It portrays the underlying structure of the enterprise's data, so this can then be reflected in the structure of databases built to support it. [DoD 8320.1-M-1]
Data Registry	A tool that supports the registration and standardization of data elements and other administered items by recording and disseminating data standards, which facilitates data sharing among organizations and users. A data registry provides users of shared data a common understanding of a data element's meaning, attributes, and unique identification. Approved data standards in the registry will be used by

	information systems developers to enable data sharing. [FAA-STD-060 Rev. B]
Data Steward[20]	A Data Steward manages the development, standardization, and certification of data within an assigned area of responsibility. A Data Steward is responsible for the accuracy, reliability, quality, and currency of descriptive information (metadata) about data in an assigned area of responsibility. [FAA-STD-060 Rev. B]
Derived Data Elements	Derived data elements represent the results of computational operations performed on other data elements. The computations may involve algorithms supported by two or more data elements within a single entity instance or algorithms summarizing data element values across multiple entity instances within a single entity or across multiple entities. [DoD 8320.1-M-1]
Entity	The representation of a set of real or abstract things (people, objects, places, events, ideas, combination of things, etc.) that are recognized as the same type because they share the same characteristics and can participate in the same relationships. [DoD 8320.1-M-1]
Information	Any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual form. Data that have been processed in such a way that it can increase the knowledge of the person who receives it. Information is the output, or finished goods, of information systems. [Order 1375.1C]
Information System	A combination of information, computer, automation system, telecommunications resources, personnel resources, and other information technology that collects, records, processes, stores, communicates, retrieves, and displays data. [FAA-STD-060 Rev. B]
Life Cycle	There are two categories of life cycle: **a. Data.** The stages through which data passes, typically characterized as creation or collection, processing, dissemination, use, storage, and disposition. **b. Information System.** The phases through which an information system passes, typically characterized as initiation, development, operation, termination, and decommissioning. [Order 1375.1C]
Logical Data Model	A fully attributed model of data entities that represents the meaning and relationships of data requirements that is independent of individual applications, software, and hardware constraints. [DoD 8320.1-M-1]

[20] According to ISO/IEC FCD 11179-6, Section C.2.3.2, "A Steward shall be an organizational unit of the Metadata Registry community. Stewards should be responsible for the accuracy, reliability, and currency of descriptive metadata for Administered Items … Stewards should be responsible for metadata within specific areas and may have responsibilities that cut across multiple areas (e.g., value domains such as date, time, location, codes of the Countries of the World)." Subsequent revision of FAA-STD-060 will update the Data Steward title and definition to reflect the ISO/IEC definition and clarify the fact that this role is not necessarily responsible for the actual data, only the metadata.

Metadata	Metadata includes information that describes the characteristics of data; facts or information about data; and descriptive information about an organization's data activities, systems, and holdings. [FAA-STD-060 Rev. B]
Metadata Repository (MDR)	An MDR is a collection of information about information systems and their data. Definitions and components of a data and information architecture are held in a metadata repository. [Order 1375.1C]
Methodology	The principles, practices, etc. of orderly thought or procedure applied to a particular branch of learning (i.e., data modeling). A set of standards and procedures used to guide the development of a data model. [DoD 8320.1-M-1]
Modeling	Application of a standard, rigorous, structured methodology to create and validate a physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. [DoD 8320.1-M-1]
NAS Data	NAS data are the data shared among NAS applications and specified in Interface Requirements Documents or Interface Control Documents that are configuration managed by the NAS CCB. [FAA-STD-060 Rev. B]
Non-NAS Data	All FAA data not specifically configuration managed by the NAS CCB. [Order 1375.1C]
Physical Data Model	A representation of the technologically independent data structures for a data base, e.g., specification of database table structures. [DoD 8320.1-M-1]
Relationship	An association between two entities or between instances of the same entity. [DoD 8320.1-M-1]
Standardization	Process of requiring applications of a standard definition and representation to a data element. [FAA Data Architecture V2]
Standard Data Element	A data element that has been formally approved in accordance with the Standardization procedures. Alternatively, standard data elements are data that have been coordinated through the standardization process and approved for use in information systems. [FAA-STD-060 Rev. B]

ACRONYMS

AMS	Acquisition Management System
ANSI	American National Standards Institute
ARTCC	Air Route Traffic Control Center
CATS-I	Capability & Architecture Tool Suite
CCB	Configuration Control Board
CCD	Configuration Control Decision
CDIMS	Collaborative Data Integration Management System
CIO	Chief Information Officer
CIP	Capital Investment Plan
CONUS	Contiguous or Conterminous United States
COTS	Commercial Off-The-Shelf
CS	Classification Scheme
CSI	Classification Scheme Item
DBMS	Database Management System
ER	Entity Relations
ERD	Entity Relationship Diagram
FAA	Federal Aviation Administration
FAST	FAA Acquisition Support Tool
FDR	FAA Data Registry
FIPS	Federal Information Processing Standards
ICAO	International Civil Aviation Organization
IDEF1X	Integrated Computer-Aided Manufacturing Definition One Extended Data Modeling Technique
IEC	International Electrotechnical Commission
IERS	International Earth Rotation Service
ISO	International Organization for Standardization
ICD	Interface Control Document
IRD	Interface Requirements Document
JTC	Joint Technical Committee
MDR	FAA Metadata Repository
MSL	Mean Sea Level
NAS	Nation Airspace System
NCP	NAS Change Proposal
NIAC	NAS Information Architecture Committee
STARS	Standard Terminal Automation Replacement System
ToR	Terms of Reference
UML	Unified Modeling Language
URI	Uniform Resource Identifier
UTC	Universal Coordinated Time
WWW	World Wide Web